THE WORLD BANK ECONOMIC REVIEW

Volume 5 January 1991 Number 1

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A SYMPOSIUM ISSUE ON THE ANALYSIS OF POVERTY AND ADJUSTMENT

THIS SYMPOSIUM ISSUE draws primarily on background papers from the World Bank's *World Development Report 1990: Poverty*. The articles in this issue were refereed in the usual way. The Editorial Board invited Lyn Squire, leader of the team that prepared the report, to write the introduction to the symposium.

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The Measurement of Poverty

Comparing Poverty Rates Internationally: Lessons from Recent Studies in Developed Countries

Anthony B. Atkinson

Studies comparing poverty in different countries frequently inform the evaluation of past policies and the formulation of future policies for reducing poverty. If the comparisons are to be a valid foundation for such assessments, in particular if they are to be a guide to the effective allocation of funds, the underlying concepts must be examined and defined. This article discusses four issues that are critical in this respect: the choice of poverty indicator, the determination of the poverty line, the unit of anlysis, and the choice of equivalence scale. A selection of studies of poverty in countries that belong to the Organisation for Economic Co-operation and Development is used to show how the choices made in defining these indicators affect the findings about the extent and composition of the poor population. Although the context is different, the experience of rich countries may yield useful lessons for developing countries.

World Development Report 1990 (World Bank 1990) estimates that a third of the population of the developing world had incomes below US$370 a head in 1985, but that the proportion varied from about half in Sub-Saharan Africa and South Asia to a fifth in East Asia and Latin America. Investigating the reasons for such differences is an obvious first resort in evaluating the success of different policies in reducing poverty, and in identifying priorities. To take a second example, estimates produced for the European Commission show the proportions in different member countries with incomes below 50 percent of the national average (O'Higgins and Jenkins 1989): such figures may be used to draw conclusions about the relative effectiveness of, for instance, the minimum wage policy in France as against the extensive social assistance network of the United

The author is a professor at the International Centre for Economics and Related Disciplines at the London School of Economics and Political Science. He is grateful to Richard Hauser, Brian Nolan, the editor of this journal, and the referees for helpful comments on the background paper (prepared for *World Development Report 1990*) out of which this article grew, and to Sandrine Cazes of Observatoire Français des Conjonctures Economiques for allowing him to draw on their joint work (Atkinson and Cazes 1990). He would also like to acknowledge that table 1 had its origins in a table presented by Stephen Jenkins at the meeting of the International Association for Research in Income and Wealth in Lahnstein, Germany, in August 1989.

Kingdom. Equally important, poverty statistics for different countries may b the basis for allocating investment and readjustment funds by supranationa bodies such as the European Community.

If international comparisons of poverty are to be used in this way, it is vital tc identify and examine the concepts on which they are based; the objective of thi: article is to provide a selective review of the principal issues involved. Th illustrations are from countries that belong to the Organisation for Economic Co-operation and Development (OECD), but the aim is to inform the analysis o poverty on a world scale, and in particular to draw lessons useful for developing countries.

I. Conceptual Issues in the Measurement of Poverty

The issues that arise in comparing poverty rates across countries are similar to those that arise at a national level, but the explicitly comparative approach gives a different perspective. Methods of measurement differ considerably, and any international comparison has to recognize this diversity of approach. The choices made affect findings on the composition as well as the size of the poor population: whether, for instance, there appear to be more elderly poor in the United Kingdom than in the United States may depend on how the poverty standard is defined, and the policy response will differ accordingly.

The four central conceptual issues considered in the article are the choice of poverty indicator, the determination of the poverty line, the unit of analysis, and the choice of equivalence scale. The studies of poverty or low incomes in OECD countries selected to illustrate these issues are listed in table 1. The selection is intended to be illustrative, not exhaustive: many OECD countries for which data exist are not shown; and for some of the countries that are shown, only one of several available studies has been selected. The countries nevertheless cover a range of income levels and types of social welfare system. Some of the studies are made by official bodies, others by independant research bodies or academics. Because the primary purpose is to bring out the extent of similarities and of differences, and their implications for international comparisons, I concentrate not on the findings (which are not shown in the table) but on the methods.

The choices of indicator, poverty line, unit of analysis, and equivalence scale are frequently discussed in the literature, but even when these have been determined significant differences remain between the ways in which poverty is measured in different countries. The need to resolve these in an international comparison is demonstrated in the more detailed case study of France, Germany, and Great Britain which closes the article.[1] Even if statisticians are provided with an apparently tightly defined brief—to measure income poverty, taking a standard

1. The two studies in question are of Great Britain (excluding Northern Ireland), not of the entire United Kingdom. "Germany" refers to the Federal Republic of Germany before reunification with the former German Democratic Republic.

of 50 percent of the national average, using the household as the unit of analysis—serious questions, of policy as much as of techniques, still remain to be answered.

Note too that the measurement of poverty cannot be seen in isolation from the design of antipoverty policy measures. In several countries, particularly those in which a social assistance scheme exists that aims to provide a guaranteed minimum income, the poverty standard has been closely linked to social security programs. Not only does this mean that national poverty measures reflect the nature and form of policy concerns, but also the operation of the programs may affect the conclusions drawn when other standards are applied in an international comparison (based, for example, on a standard of 50 percent of average incomes).

Choice of Poverty Indicator

For the purposes of this article, poverty is assumed to be defined in terms of a single broad indicator of economic resources. This assumption in itself is restrictive. If the concern about poverty takes the form of concern about basic needs, such as food, housing, and clothing, the focus should be on individual items of consumption, and poverty would need to be measured in a multidimensional way, rather than in terms of a single indicator. The same consideration may apply if we are concerned about time as an input and about "time poverty" as well as deprivation of commodities. Or concern about poverty may relate to social or demographic indicators, such as life expectancy or literacy. These multidimensional aspects of poverty are not considered here, even though they may influence comparisons across countries. Countries may differ in the extent of their social provision, and this may affect the interpretation to be placed on a specified level of economic resources. In determining the appropriate relative poverty lines in, say, France and Sweden, account has to be taken of differences in the public provision of medical care, education, and so on. Do parents have to buy school books for their children? For this reason, a method that encompasses a number of indicators—see, for instance, table 2-1 of World Bank (1990)—has a lot to recommend it.

If the measure of disadvantage is limited to a single index of economic resources, then a natural choice may appear to be total consumption, or expenditure plus home produced goods and services. A household is then said to be poor if its total consumption is below a specified amount. But most studies of poverty in advanced countries record poverty on the basis of total income rather than consumption—income is in fact the basis for all the studies listed in table 1 apart from those in Greece.

Why is income used? The first answer is that it is taken as a proxy for living standards, because these are hard to quantify. As such, assessments of poverty based on income have to be qualified: income may understate or overstate the level of living. If a family can dissave or borrow, its current level of living is not constrained by current income. Temporary variations in income may be

Table 1. *Poverty and Low-Income Studies in Selected Member Countries of the Organisation for Economic Co-operation and Development*

	Studies considered in case study										
Item	*Great Britain[a] (low-income families)*	*Great Britain[a] (households below average income)*	*France*	*Germany*	*Ireland*	*Finland*	*Sweden*	*United States*	*Canada*	*Australia*	*Greece*
Period covered	1972–77, 1979, 1981, 1983, 1985	1979, 1981, 1983, 1985, 1987	1984–85	1963, 1969, 1973, 1978, 1983	1980 and 1987	1966, 1971, 1976, 1981, 1985	1967, 1975, 1978, 1980–85	1959–present	1961–present	1966, 1972–73, 1978–79, 1981–82, 1985–86	1974 and 1982
Poverty indicator	Disposable income net of housing costs (= resources), "normal"	Disposable income, current or disposable income net of housing costs, current[b]	Disposable income, annual	Disposable income, annual	Disposable income, current[b]	Disposable income, annual	Disposable income, annual	Gross income, annual[c]	Gross income, annual[c]	Disposable income, annual (also disposable income net of housing costs)	Consumption expenditure, weekly
Poverty line	Supplementary Benefit scale (+ 10 percent, 20 percent and 40	50 percent of mean income (also 60, 70, 80, 90 and 100 percent)	50 and 60 percent of median income	40 percent and 50 percent of mean income (also social assistance level)	40, 50 and 60 percent of mean income	National pension level, adjusted over time as benefit increased or 50 percent	Social assistance level in 1985 (allowing for housing costs), adjusted by	Official poverty line, adjusted over time by consumer price in-	Statistics Canada low-income cut-off, adjusted by consumer	Henderson poverty line, adjusted initially by average earnings, since 1981	2/3 median consumption expenditure per equivalent adult

	percent), adjusted over time as benefit increased					of median income	price index	dex (also 125 percent of this line)	price index, and revised in 1969, 1973, 1978 and 1986	by household disposable income per capita	
Unit of analysis	Inner family (= benefit unit)	Household	Household	Household	Household	Family	Family	Family	Family	Inner family	Household
Equivalence scale (single person = 1) for couple and for child (aged 15 or under)	Couple = 1.62 Child = 0.34–0.62[d]	Couple = 1.64 Child = 0.15–0.44[d]	Couple = 1.70 Child = 0.50	Couple = 1.8 Child = 0.45–0.75[d]	Couple = 1.6–1.7 Child = 0.3–0.5	Couple = 1.7 Child = 0.5	Couple = 1.59 Child = 0.44[d]	Couple = 1.25 Child = 0.21–0.46[e]	Couple = 1.36 Child = 0.18–0.37[e]	Couple = 1.41 Child = 0.34 (simplified scale)	Couple = 2.0 Child = 0.25–0.40[d]
Reference	Department of Health and Social Security (1988)	Department of Social Security (1990)	Assemat and Glaude (1989)	Hauser and Semrau (1989)	Nolan and Callan (1988)	Gustafsson and Uusitalo (1989)	Gustafsson and Uusitalo (1989)	U.S. Bureau of the Census (1981)	Wolfson and Evans (1989)	Saunders and Whiteford (1989); Bradbury and Saunders (1990)	Tsaklogou (1989)

a. Excludes Northern Ireland.
b. Self-employment and investment income averaged over a longer period.
c. Disposable income is the most relevant variable, but in Canada and the United States pretax income has been used because of data limitations.
d. Depending on age.
e. Depending on position in family.

smoothed out (though such borrowing may be expensive, with serious consequences for the future). A family that can share in the consumption of others may have higher living standards than its income would permit. An elderly person living with his or her children may benefit from their expenditure. Such considerations would lead one to expect the estimates of poverty to be lower, other things equal, in Greece than in the other countries shown in table 1.

Conversely, income may overstate the level of living when money alone is not sufficient to buy the necessary goods, for instance, if there is rationing or if goods are not available. An obvious implication is that one would have to be careful in making comparisons across countries with different market structures, particularly with regard to housing. It would certainly be unwise to compare the studies in table 1 with those for Eastern European countries, without taking this consideration into account.

The second reason for using income rather than consumption is that it may be seen as intrinsically preferable as an indicator of resources in the measurement of poverty. One argument is that people may choose a low level of consumption, whereas income is closer to a measure of the opportunities open to a family and not influenced by the consumption decisions made: the concern then is with the budget constraint, not with consumption choices. Alternatively, we may move away from the conception of poverty as concerned with standards of living to poverty as concerned with minimum rights to resources (Atkinson 1989, chap. 1). In this view, people are seen as entitled, as citizens, to a minimum income, the disposal of which is a matter for them. This right to a minimum income may be regarded as a prerequisite for participation in a particular society, as a guarantee of "positive freedom."

The conception of poverty adopted will in turn affect more detailed choices about how best to measure it. If income is being used as a proxy for consumption, permanent income may be a closer match than current income, so that in practical terms annual income may be a better indicator than income in a week or month. The choice of time period for income depends in this case on matters of fact. How important are seasonal fluctuations? How far can people in reality borrow to tide their families over bad times? Adoption of the minimum rights standpoint, conversely, involves judgments about interpretation. On the interpretation that the right is to a guaranteed minimum below which no one should fall, even temporarily, current weekly income may be the better indicator.

The definition of poverty chosen will also affect the way income is defined. A standard of living definition will include an estimate of income in kind. (Home production of food is an example, as is the receipt of transfers in kind such as food stamps.) But a minimum rights interpretation might not count income in kind, because it may be cash income that is necessary for people to participate in society. More generally, different items of income may make greater or lesser contributions to the objective in question. The receipt of income may be subject to conditions that reduce its effective value. On a minimum rights interpreta-

tion, for example, we may want to apply a discount to income received subject to a means test that is regarded as a social stigma.

The choice of indicator has to be addressed in the design of social security programs that aim to ensure some minimum standard. Such programs have for evident reasons not taken expenditure as an indicator and typically involve an income test. This test is, however, often accompanied by an assets condition. Those eligible are people with incomes below a qualifying level whose net worth does not exceed a specified level, which conditions may be seen as taking account of the person's capacity to finance consumption by dissaving. Such an approach takes us back to a multidimensional measure of poverty.

The institutional arrangements for income support in OECD countries also identify the special role of housing expenditure. In Great Britain, for example, income support takes the form of a cash amount intended to cover needs other than those of shelter, the latter being met (approximately) in full by housing assistance. Accordingly, the benefit-based poverty standard in Great Britain has been measured on the basis of "net resources," or income after deduction of housing costs (see the first column in table 1); the same has been done in Australia. As a result, the poverty cutoff in terms of total income for a particular family depends on its own housing costs. Such an approach may be seen as treating housing expenditure as an unavoidable outlay, or as adjusting for variation across people in the prices faced for housing (for example, where there are rent controls). It may be justified on the grounds that the measure of income does not capture the full benefit to owner-occupiers from the services of the house they own: if the imputed rent of owner-occupiers is not included in income, then the subtraction of the rent actually paid by tenants would put the two tenure groups on the same footing. The institutional features of the housing market in individual countries need to be taken into account.

Determination of the Poverty Level

If standard of living is the concern, then the most straightforward way to determine the poverty line is to specify a basket of goods, denoted by the vector x^*, purchasable at prices p, and to set the poverty standard as a subsistence standard:

$$(1) \qquad (1 + h)p \cdot x^*$$

where h is a provision for inefficient expenditure or waste, or a provision for items not included in the list x^*. This was in effect the method followed in the United States in the derivation of the official poverty line, where x^* represented food requirements and h made allowance for spending on other goods. The list x^* was based on the U.S. Department of Agriculture's "economy food plan" for households of different composition, and the multiplier to allow for other goods was 3. This method differs from, but has some relation to, the definition of the poverty line as the income at which households spend a specified proportion on

necessities. The Canadian low-income cutoff was based originally on the income level at which more than 70 percent was spent on food, clothing, and shelter (Poduluk 1967).

As was recognized when the U.S. official poverty line was introduced, there is room for considerable disagreement about the subsistence standard. Political judgment played a considerable role in determining the "$3,000 for a family of four" that featured prominently in the speeches launching the War on Poverty, as also in the use by the European Commission of a benchmark of 50 percent of average national income in measuring poverty in Europe. (As may be seen from table 1, the same benchmark approach, with differing percentages, has been used in several European studies.)

These two examples serve also to illustrate the difference between a poverty line such as that depicted in equation 1 adjusted for changes in prices, and often referred to as an "absolute" poverty standard, and a "relative" line related to contemporary levels of living. The latter may follow naturally from the minimum rights approach, where poverty is seen in terms of people being excluded from the "living conditions and amenities which are customary, or at least widely encouraged or approved, in the societies to which they belong" (Townsend 1979, p. 31), or what is often referred to as a participation standard. In adopting its definition, the European Community stated: "The poor shall be taken as to mean persons, families and groups of persons whose resources (material, cultural and social) are so limited as to exclude them from the minimum acceptable way of life in the Member State in which they live" (Council Decision, 19 December 1984).

The choice between an absolute and a relative standard takes on particular importance in international comparisons. *World Development Report 1990* (World Bank 1990) used a common dollar figure, adjusted by purchasing power parities, across countries, to reach its US$370 poverty standard; such a method evidently leads to quite different conclusions from those reached applying a specified percentage of national average income. This applies even when countries at relatively similar stages of economic development are compared, as is shown for the eleven European Community countries in table 2. Applying a poverty standard of 50 percent of each country's average income yields a poverty rate overall of 13.9 percent, with the countries with significantly below-Community average incomes (Greece, Ireland, Portugal, and Spain) accounting for 32 percent of those in poverty. But if a poverty line equal to 50 percent of the Communitywide average is used, converted at purchasing power parities, the poverty line for Spain (for instance) would be some two-thirds of its national average. The overall poverty rate now rises (see the right-hand side of table 2) to 17.4 percent, and the lower-income countries (Greece, Ireland, Portugal, and Spain) account for a much larger proportion (55 percent) of those in poverty.

The adjustment of the poverty line may take an intermediate form; for example, in some countries the line has been adjusted regularly for price increases, with additional real increases from time to time as a result of a special decision.

Table 2. ***Distribution of the Poor in Europe: Comparison of Poverty Lines Based on National Income and Communitywide Income***
(percent)

	Share of the European Poor Given Poverty Line equal to 50 percent of Average	
Country	*National Income*	EC *Income*[a]
France	21	12
Spain	18	26
Italy	15	16
United Kingdom	15	11
Germany	11	3
Portugal	7	16
Greece	5	10
Ireland	2	3
Netherlands	2	1
Belgium	2	1
Denmark	2	1
Overall	13.9	17.4

Note: Luxembourg is not shown separately.
a. EC (European Community) average income is calculated on the basis of national averages converted at purchasing power parities.
Source: Author interpolation based on calculations of O'Higgins and Jenkins (1989).

In Canada, the Special Senate Committee on Poverty argued in 1971 that there should be a real increase "to take account of changing socioeconomic conditions over the last decade" (quoted by Wolfson and Evans 1989, p. 12). The ensuing policy changes led to the real value of the poverty line following a step pattern over time. Alternatively, the line may rise steadily in real terms, but less than the increase in other incomes. Subjective definitions of poverty, based on survey responses to questions about the minimum necessary income, have produced such an outcome. In the United States, the Gallup Poll has regularly asked the question: "What is the smallest amount of money a family of four needs each week to get along in this community?" An analysis of the responses over the period 1957–71 by Kilpatrick (1973) showed that they tended to rise about 0.6 percent for each 1 percent rise in per capita income. He notes that on this basis the poverty line would have increased in real terms by some 25 percent between 1959 and 1971, and that the poverty rate would have fallen, not from 22 percent to 12 percent (as it would had the rise in the poverty line kept up with increases in per capita income), but only from 22 percent to 18 percent. In Australia, where the Morgan Gallup poll collects similar data, the average reported minimum amount doubled in real terms between the 1950s and the 1970s (Saunders and Bradbury 1989).

The relation of the poverty line to the objectives of economic and social policy is also important. The U.S. official poverty line was designed quite independently of benefit programs. The Council of Economic Advisers stressed that "no measure of poverty as simple as the one used here would be suitable for deter-

mining eligibility for particular benefits" (U.S. Council of Economic Advisers 1964, p. 58).

In contrast, postwar studies of poverty in the United Kingdom, following Abel-Smith and Townsend (1965), have in several instances taken the scale o entitlement to social assistance (called National Assistance from 1948 to 1966 then Supplementary Benefits until 1988) as the basis for defining low incomes In Finland, Germany, and Sweden, studies have also used benefit scales. One immediate implication is that adjustments of the scale over time have been in line with benefits rather than prices or average incomes. In the case of Finland, the scale appears to have risen about 0.7 percent for each 1 percent real increase in the median income (on the basis of the estimates of Gustafsson and Uusitalo 1990), and in Germany the rise appears to have been around 0.9 percent for each 1 percent real increase in the average net wage (on the basis of the estimates made by Hauser and Semrau 1989).

The measurement of poverty may also be affected by income maintenance policy if the latter leads to a concentration of people at a particular income level. Taking an international yardstick, such as 50 percent of average income, may lead to misleading conclusions about the proportion in poverty if Country A has a social minimum of 47.5 percent of the average and Country B has a social minimum of 52.5 percent.[2]

Unit of Analysis: Residence, Spending, and Relationships

The unit of analysis refers to the group of persons for whom resources are assumed to be combined when poverty status is being assessed. A range of different definitions of the unit of analysis is in use—see table 1. The definitions are based on a number of different elements:

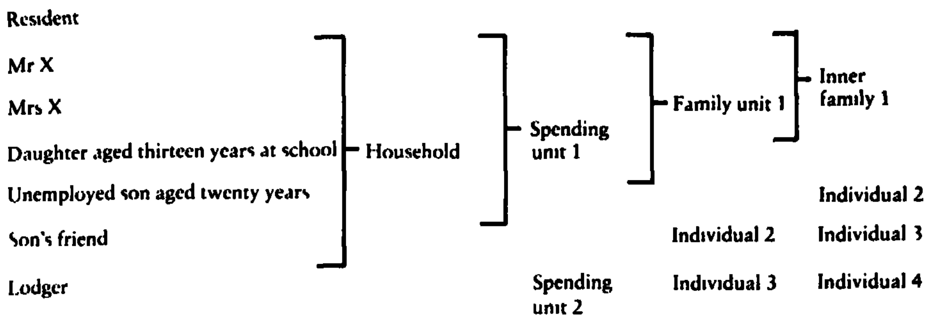
- Common residence, with a household comprising those resident in a dwelling and sharing some degree of common housekeeping; this typically constitutes the most extensive unit of analysis
- Common spending, where the spending unit is defined as those taking spending decisions to a considerable degree in common, where this may cover people who have no family relationship
- Blood or marital relationship, where members of the family unit are related by marriage or cohabitation or by blood relations
- Dependence, as where the unit is defined to include a single person or couple plus any dependent children; this constitutes the inner family.

The different possibilities are illustrated in figure 1. As set out there, the criteria are typically applied cumulatively, so that the family unit refers to those members of the family resident in the same household.

In considering the choice between different units, it is helpful to consider first the standard of living approach. Some items of consumption, such as food, are

2. This is of course an argument against relying solely on a headcount measure of poverty. The relative merits of different poverty measures are not considered here—see Atkinson (1987).

Figure 1. *Illustration of Different Units of Analysis*



essentially individualistic, whereas others, such as housing, have some of the attributes of public goods as far as individuals in the household are concerned. For the latter, the spillover may be such that all members of the household enjoy broadly equal levels of living, but for the former there may be considerable inequality within the household or according to gender. The distribution of benefits within the unit is extremely difficult to observe. It is not therefore surprising that in practice many studies have based their analysis on the spending unit, assuming that all within the unit share the same standard of living, or on the household—allowing for the difficulties in treating housing outlays (see table 1). But in ignoring the potential for intrahousehold inequality, these assumptions about resource sharing may misrepresent the extent and nature of poverty (see Haddad and Kanbur 1990 for an investigation of the empirical importance of intrahousehold inequality in a developing country).

When the minimum rights approach to defining poverty is taken, the theoretical concept of rights is usually assumed to be individualistic. The case for considering in practice a wider unit than the individual, such as the inner family, rests on an assumption that within-family transfers are taking place that cannot be adequately observed. In other words, we do not accept that a large number of those with zero recorded cash income are in fact without resources. At the same time, it may be quite wrong to treat all married couples as having equal rights to

the joint income. Even if within-family transfers are such that total fam income is equally divided, one cannot treat all sources of income as equivale $100 earned by the wife may be valued more highly than $100 given by l husband to pay for the housekeeping. Within the household, transfers fr children to elderly parents may be conditional (for example, on the old pers going to live with the children) and may induce dependence. From the minimu rights standpoint, there is a strong case for attempting to measure poverty on individual basis, using, for example, information on the original source of come (this being easier to observe than the distribution of consumption). It only in this way that issues such as the feminization of poverty can be adequat discussed.

The significance of the choice of unit of analysis may be demonstrated b single example. Until 1985, the official statistics for Great Britain were based the inner family unit (table 1). The new Households Below Average Inco series is based on the more extensive unit of people "living at the same addr having meals prepared together and with common housekeeping." Among t arguments for this change were that most people in such units are closely lated, so that the household is close to the family unit as defined above, and tl the living standards of its members are more likely to be related to the to income than to their individual income. (In terms of figure 1, son is likely to better off than would be indicated by his unemployment benefit.) The effects the change in definition on the results for 1983 have been investigated by Jol son and Webb (1989), who show that the proportion of the population w income below 50 percent of the average is 11.1 percent on an inner family ba and 8.1 percent on a household basis.

In other words, the changed unit of analysis reduces the number of peo with low incomes by 25 percent. And the change to a household basis a affects the composition of the low-income population: the proportion of sin nonpensioners below half the national average becomes 8 percent, as agai more than 20 percent on an inner family basis (Johnson and Webb 1989, p. 7.

Equivalence Scales

If a unit of analysis other than the individual is used, the equivalence scales be applied to different-sized units need to be considered. An equivalence sca gives the relation between the poverty line for, say, a couple and that for a sing person. Equivalence scales may be relevant even on an individual basis, if w wish to make allowance for differing needs according to age, degree of han icap, and so on. The different methods used to arrive at such scales can produ very different results. Table 1 illustrates the variation in the scales applied in t different studies. The scale for a couple, relative to a single person, vari between 1.25 and 2.0. Although there is some clustering in the range 1.6 to 1. more than half lie outside. The scale for a child varies between 0.15 and 0.75.

More generally, the differences between equivalence scales have been conv

niently summarised by Buhmann and others (1988) in terms of the following formula:

$$\text{equivalent income} = \text{total income} / n^s$$

where n denotes the number of members of the unit and s is the elasticity of family "need" with respect to family size. A value of $s = 0$ corresponds to making no adjustment for family size, and $s = 1$ corresponds to taking per capita income. Equivalence scales based on subjective evaluation (of what is needed "to get along") tend to produce relatively low values for the elasticity; Buhmann and others take a value of 0.25 as representative. Estimates based on observed consumption patterns, and identifying assumptions, tend to be higher; Buhmann and others take a representative elasticity of 0.36. Estimates used in policymaking—those embodied in benefit scales or the official U.S. poverty line—are quite substantially higher: around 0.55. And those used in statistical studies by the OECD and other bodies are represented by an elasticity of 0.72.

Buhmann and others use these representative elasticity values to explore the consequences of using different equivalence scales; a selection of their findings is shown in table 3 for the OECD countries included at that time in the Luxembourg

Table 3. *Reported Proportion of Population with Income below 50 Percent of the Median: Results for Different Equivalence Scales (Luxembourg Income Study)*
(percent)

	Type of scale			
Country	*Subjective*	*Observed consumption*	*Policymaking*	*Statistical*
United States	17.9	17.8	17.2	17.2
	(30.5)	(28.3)	(24.3)	(20.7)
Australia	16.0	14.8	12.3	11.7
	(37.1)	(32.7)	(18.7)	(8.9)
United Kingdom	15.2	14.0	11.4	8.1
	(66.2)	(64.9)	(55.4)	(34.9)
Canada	15.0	14.4	13.2	12.3
	(32.3)	(29.9)	(22.7)	(15.1)
Switzerland	10.5	9.8	8.5	8.3
	(45.4)	(39.9)	(30.1)	(19.0)
Norway	10.3	8.9	5.1	5.2
	(54.6)	(49.3)	(22.5)	(18.4)
Sweden	7.9	6.5	5.4	5.3
	(34.8)	(25.3)	(11.6)	(5.1)
Germany	7.6	6.6	5.2	5.4
	(64.3)	(60.2)	(50.4)	(34.3)
Netherlands	7.3	7.2	8.0	8.8
	(15.7)	(12.8)	(10.8)	(9.4)

Note: Numbers in parentheses are the percentage of those poor households in which the household head is aged 60 years or more. The data used here are not necessarily the same as those referred to in table 1.

Source: Buhmann and others (1988, tables 10 and 13).

Income Study data set (see Smeeding, O'Higgins, and Rainwater 1990). The choice of scale can significantly affect conclusions as to the extent and composition of the low-income population. Although the proportion below 50 percent of the median changes little for the Netherlands and the United States, that in Norway and the United Kingdom is approximately halved on moving from the subjective to statistical scales. The United Kingdom ranks third on the former basis and sixth (out of nine) on the latter. In Norway, older people account for 55 percent of the poor when the subjective scale is employed, but 23 percent with the policymaking scale, and 18 percent with the statistical scale. Using the subjective scale, the older group constitutes the majority of the poor in Germany, Norway, and the United Kingdom, but with the statistical scale the highest proportion is a third (in the United Kingdom and Germany).

II. A Case Study of an International Comparison: France, Great Britain, and Germany

The discussion so far has illustrated the strong influence the differing methods used in the studies may have on the conclusions drawn. To illustrate the corresponding difficulties that beset comparison of such findings, we now describe the results of an attempt to compare poverty in three of these countries—France, Great Britain, and Germany—using the studies indicated in table 1.

The starting point for the investigation is the European Community calculation; the poverty standard is therefore taken as 50 percent of the national average income. Of the two studies for the United Kingdom, the Households Below Average Income study is thus the more apt to the purpose. According to this study (U.K. Department of Social Security 1990, p. 21), in 1985, 9.2 percent of the population of Great Britain lived in households with an income below 50 percent of the mean. In France (Assemat and Glaude 1989, p. 5), in 1984–5, 10.9 percent of households had income below 50 percent of the median. In Germany (Hauser and Semrau 1989), in 1983, 7.0 percent of the population lived in households with incomes below 50 percent of the mean.

Can we conclude from these figures that in the mid-1980s low incomes were less prevalent in Germany and (somewhat) more prevalent in France than in Great Britain? No, for—despite their apparent comparability—the differences in the methods by which the estimates are made are still significant.

The poverty indicator is taken to be net of tax income for the studies in all three countries (the figure for Great Britain being that for income rather than income minus housing costs). But the British figure is for current (weekly or monthly) income, whereas the data for the other two countries are for annual income.[3] This difference is likely to affect the measured extent of poverty (mak-

3. Strictly, the income definition for Great Britain is a mixture, with earned income and transfers relating to the current pay period but investment and self-employment typically relating to a previous year; see, for example, Atkinson and Micklewright (1983) and Nolan (1987, p. 69).

ing the figure for Great Britain higher), and the composition of the poverty population (if pensioners, for example, are less subject to income fluctuations).

The three studies are comparable in using a household unit of analysis, although the precise definition may vary from country to country. But the equivalence scales employed are noticeably different. For a couple with two children, the scale (single person = 1) is: France, 2.7, corresponding to an elasticity of 0.72; Germany, 2.7–3.3 (depending on age of children), corresponding to an elasticity of between 0.72 and 0.86; and Great Britain, 1.79–2.15 (depending on age of children, these being less than 15 years), corresponding to an elasticity of between 0.41 and 0.55.

Such differences are not as large as those between the subjective and statistical scales discussed earlier, but they are nonetheless sizable. Without access to the microdata in each country, it is not possible to evaluate the quantitative impact on the measured extent of low incomes, but the differences in equivalence scales could change the ranking of the three countries.

Nor is this the end of the problems. Examination of the calculation of the poverty line reveals further divergences. To begin with, in France the median rather than the mean is employed. For the French data cited earlier, the mean is 13 percent higher than the median, so that this difference in definition causes the poverty rate to be understated, relative to that in the other two countries, by about one-third (Atkinson and Cazes 1990). Second, the mean (or median) is calculated in different ways (see O'Higgins and Jenkins 1989), as follows:

(Household $h = 1, \ldots, H$ has total income y_h, contains n_h persons, and e_h equivalent adults. The equivalent income for the household is y_h/e_h.)

Method Alpha: $\frac{1}{H}\Sigma_h\left(\frac{y_h}{e_h}\right)$

Method Beta: $\frac{\Sigma_h\left\{\left(\frac{y_h}{e_h}\right)\cdot e_h\right\}}{\Sigma_h e_h} = \frac{\Sigma_h y_h}{\Sigma_h e_h}$

Method Gamma: $\frac{\Sigma_h\left\{\left(\frac{y_h}{e_h}\right)\cdot n_h\right\}}{\Sigma_h n_h}$

In France (Method Alpha), the average is obtained by taking the equivalent income for each household and treating each household as one unit irrespective of the number of people. In Germany (Method Beta), the average is obtained by weighting each household by the number of equivalent adults, which is the same as dividing total income by the total number of equivalent people. In Great Britain (Method Gamma), the weights are the number of persons. The method

can again make a noticeable difference: applying Method Beta to French data for 1979 reduces the mean, relative to that obtained by Method Alpha, by 12.5 percent (O'Higgins and Jenkins 1989, background information). Third, the related question arises of the weighting adopted in the poverty count. In Great Britain and Germany, the figures count the total number of people; in France, the figures show the total proportion of households. This is important to the extent that the poverty rate differs by size of family.

The significance to be attached to the observed differences in poverty rates depends also on the reliability of the data sources. The studies are all based on household budget studies, but two of them compare the results from different data sources. Assemat and Glaude (1989) have access to a matched sample of households who appear in both the budget survey (Enquête Budgets) and the tax records (Enquête Fiscale), and show that the estimated poverty rate is about 20 percent lower in the latter case. Two of the reasons that they identify for the divergence are illustrative of the kinds of problem that arise. First, the fiscal data attribute to all eligible elderly the minimum guaranteed income to which they are entitled. In view of the evidence that a non-negligible proportion of the elderly do not in fact claim, the number with low incomes will be understated. However, the budget survey is based on reported receipt of transfers, and there is evidence of underreporting, so that the number of elderly with low incomes is overstated. Second, the budget survey shows a larger proportion of farmers and self-employed below the low-income cutoff, and it may be that there is a tendency for this sector to understate income.

The underreporting of income is similarly given as one reason for the divergence in Germany between the results just quoted, which are based on budget survey data, and those derived from the Socio-Economic Panel, although in this case the budget survey is considered to be more complete. The proportion found to be below 50 percent of the mean is about twice as high in the Panel Study. Hauser and Semrau (1990, p. 34) argue that the more extensive procedure of the budget survey allows cross-checking and more comprehensive recording than the single interview of the Panel. There is, however, a second possible explanation which they advance. For both surveys participation is voluntary, but whereas the Panel is a random sample, the budget survey is based on a call for volunteers. In both cases a reweighting procedure is applied, but it is believed that low-income households remain underrepresented in the budget survey (Kitterer 1986).

The case study just described should serve as a warning of the difficulties involved in making detailed intercountry comparisons. Even if statisticians are provided with an apparently tightly defined brief—to measure poverty in terms of income, taking a standard of 50 percent of the national average, using the household as the unit of analysis—there may still be serious divergences in the methods and findings. The case study made use of existing results, and some of the differences could be eliminated by returning to the raw microdata. The equivalence scales could be harmonized; the methods of calculating the poverty

line could be brought into line; the sensitivity of the results to different adjustments for underreported income could be assessed. But some differences would remain that could not be resolved without changes in the raw statistics collected. The time period of income is an example, as is the differing design of the samples. A full-scale comparative exercise is therefore likely to entail a substantial statistical effort which, to be effective, would require the participation of people familiar with the situation in the countries studied—in relation both to the statistical data and the institutional context.

III. Concluding Comments

The aim of this article has been to emphasise the need for clarity about the concepts employed in studying poverty. The "mischievious ambiguity of the word poor," to use the phrase of the British Poor Law Report of 1834 (quoted by Himmelfarb 1984, p. 523), may be inescapable in political rhetoric, but behind the rhetoric there must be explicit analysis as to what one means by poverty. Clear understanding of the terms of reference becomes even more important when poverty is compared across countries, where terms carry differing significance and where their implications are affected by differing social institutions.

The definition of the poverty indicator, of the poverty level, and of the unit of analysis is not a purely technical matter. It involves judgments about the objectives of policy. Any cross-country comparison of poverty has therefore to consider the purposes of the analysis and the relation between its objectives and those pursued within the countries studied. If the purpose is to measure the relative extent of need in different countries, then external criteria may be appropriate. A supranational body may, for example, decide to measure poverty on an individual basis because it is particularly concerned with gender inequality, even though national governments do not attach the same priority. If, however, the purpose is to assess the comparative effectiveness of antipoverty policy, then national objectives become relevant. A country that gives high priority to the needs of children, and provides generous family support, may score well if the equivalence scale treats children as close to adults, but much less well on another scale.

The interrelation between policy and measurement means that it is important to relate the observed statistics to the underlying economic and social institutions. This applies even to countries as close geographically and economically as those of Western Europe. Woolf (1986) has drawn attention to the differences among Protestant countries such as Denmark, England, and the Netherlands, where outdoor relief was established early as an obligatory parish function, and the Catholic countries, where it remained a matter of charity. The Beveridge tradition of flat-rate social security benefits is different from the earnings-related benefits found in other countries influenced by Bismarck. Such historical differences leave their traces today in the differing forms of income support, and these in turn influence the observed distribution of income.

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Poverty in Palanpur

Peter Lanjouw and Nicholas Stern

The meaning and identification of poverty are examined using three indicators of standard of living in the North Indian village of Palanpur. The first is intended as a measure of "apparent prosperity" based on the personal assessments of investigators after intensive field work in the village over the full agricultural year 1983-84. The other two are income in 1983-84, and a measure of permanent income obtained by averaging incomes from four surveys conducted over a twenty-six-year interval. A comparison of these three indicators shows that income measured in any one year may give a misleading impression of the incidence of poverty. The risk of poverty for households is calculated. Vulnerability is high among low-caste households and those which are involved in agricultural labor. Categories, however, are not homogeneous; for example, whereas the landless and widows are more likely to be poor, some of such households are quite well off. It is argued that poverty in a good agricultural year is a better indicator of sustained poverty than poverty in a bad year. Occupational mobility out of agricultural labor is low, and changes in the distribution of land are largely accounted for by demographic processes such as household splits.

We examine in this article the definition, identification, and determinants of poverty in the village of Palanpur in North India. We discuss correlates of poverty which are commonly analyzed or used in policy design, paying particular attention to understanding why and to what extent they may be appropriate for such use. We draw on data from four detailed surveys conducted in Palanpur in 1957-58, 1962-63, 1974-75, and 1983-84, as well as data and observations recorded on frequent visits to the village since 1974-75. The relative advantages and disadvantages of large-scale surveys of poverty in comparison with small-scale, village-based studies is a matter of some debate (Bardhan 1989), but both have a role in increasing our understanding of poverty.

The authors are at the London School of Economics and Political Science, University of London. This article is an outgrowth of collaborative work of the authors with Jean Drèze on social and economic change in Palanpur, a project in which he played a central role. Section II of this article draws extensively on his contributions to other joint papers within the project, and the authors are also indebted to him for his contributions to and detailed comments on earlier drafts of this article. The authors are also grateful for discussions with Christopher Bliss and Naresh Sharma and for the comments of Ehtisham Ahmad, Robin Burgess, Stephen Howes, and Jean Lanjouw. The project was supported by the U.K. Overseas Development Administration and the Suntory Toyota International Centre for Economics and Related Disciplines at the London School of Economics and Political Science, University of London.

The intensive study of one village provides detail on living standards not available by other means. For example, such a study can reveal whether the lifestyle of a villager appears very different from that which might be implied by measured income, whether there are any particular circumstances concerning household members' health or problems with its animals, equipment or fields which might disrupt income, whether nonagricultural employment is likely to persist, whether tenancy exists, and so on. Such questions can be crucial to the sensible definition, measurement, and accurate interpretation of income, or, more broadly, standard of living, and thus of poverty.

A village study can identify those underlying mechanisms affecting the incidence and severity of poverty which might be concealed in larger surveys, and it can provide a check on standard procedures of measuring poverty to ensure that they are not misleading. At the same time a village study cannot have the scope of a larger survey, so one must be aware of any special conditions in a particular village which might make it a misleading example. Although Palanpur does not seem to be outstandingly unusual in any critical sense, we do not claim that it, or any other single village, could be representative of the more than half a million villages in India. One must be careful in generalizing what has been learned in Palanpur to all of rural India. But, at the same time, if we find that common paradigms of village India do not apply, or that particular policies implemented in, or proposed for, the countryside appear to be inappropriate in Palanpur, we are entitled to ask why that is. The village study and the large-scale survey are, or should be, complementary vehicles for analysis.

Palanpur is situated in the district of Moradabad in western Uttar Pradesh. The railway line between Moradabad and the smaller town of Chandausi runs just outside the village and provides the main connection between Palanpur and the outside world. The village is surrounded by open fields (the "village land") covering about 400 acres. At the beginning of the 1983–84 survey, the village numbered 960 inhabitants divided into 143 households. Hindus made up 87 percent of the village population, and Muslims 13 percent.

The three largest castes in the village are Thakur, Murao, and Jatab. The Thakurs, who belong to the Kshatriya group, occupy the top position in the social hierarchy. They were traditionally warriors, and even though most of them are currently farmers, factory workers, or government employees, they nevertheless retain a noticeable preference for military service and a discernable aversion to most forms of manual labor. The Muraos, traditionally a cultivating caste, are the opposite in their attitude toward labor. They share a strong ethic of hard work, frugality, independence, and honesty. Many are also skilled farmers, and they have taken the greatest advantage of recent technological advances in agriculture. Their progress has become a source of acute rivalry with the Thakurs, who are rapidly losing their ability to retain a privileged economic and social position while minimizing their work effort. The Jatabs in Palanpur are traditionally leather workers and belong to one of the so-called

Scheduled castes, which, being particularly disadvantaged, have been singled out in the Indian constitution for special assistance. Most of them are now casual laborers or marginal farmers.

More socioeconomic details on Palanpur are provided in table 1. Further details of the village and analysis of its economy based on data from 1974–75 can be found in Bliss and Stern (1982). Preliminary results and analysis based on data collected in 1983–84 can be found in Drèze and Stern (1986); Drèze and Mukherjee (1987); Drèze (1988); Drèze (1990a, 1990b); Drèze and Sharma (1990); Drèze, Lanjouw, and Sharma (1990); Kynch and McGuire (1989); and Lanjouw and Stern (1989).

The article is organized as follows. In section I we consider the problems of measuring standard of living in a village like Palanpur. In section II we examine the relationship between poverty and household characteristics which incorporate different definitions of income and poverty. A more formal analysis of the determinants and correlates of poverty is presented in section III, and in section IV we consider mobility and the distribution of income. Section V is devoted to some concluding remarks.

I. Measuring Standard of Living

The empirical work reported here concentrates on two measures of standard of living. The first, the "apparent prosperity" index for 1983–84, is based on the observations and assessments of Jean Drèze and Naresh Sharma, who lived in Palanpur throughout the agricultural year 1983–84. The second is a measure of current per capita income in each of the survey years.

The affluence of a household in a small village is, to a great extent, a matter of common knowledge. Similarly, the extent to which a particular household's asset position, or the health and nutritional status of its members, bears on the household's prosperity is also widely understood. The investigators who constructed the apparent prosperity classification were involved in intensive fieldwork in Palanpur for more than a year and therefore had access to this common knowledge.

The classification was carried out in several stages. Initially, all households were divided into seven groups by Drèze. These groups were labeled very poor, poor, modest, secure, prosperous, rich, and very rich (Drèze 1988). These labels roughly correspond to the way in which different households would be described in the village itself. Needless to say, there is no implication that any of the households of Palanpur can be considered very rich in an objective sense. The number of households in these fractiles was, respectively, 8, 8, 43, 38, 29, [illegible], and 11. Next, Sharma (who collaborated with the fieldwork throughout 1983–84) produced an independent classification of Palanpur households, aiming at fractiles of the same size as Drèze's. Reassuringly, there was a strong degree of agreement between the classifications of Drèze and Sharma, with 137

Table 1. *Palanpur: Basic Socioeconomic Characteristics, 1983–84*

Caste	*Number of households*	*Number of individuals*	*Traditional occupations*	*Main current occupations*	*Land owned per capita (bighas)*	*Number of households with at least one member in regular nonagricultural employment*
1. Thakur	30	217	Landlords	Cultivation; outside jobs	3.51	13
2. Murao	27	217	Cultivation	Cultivation	4.979	6
3. Dhimar	13	74	Water carriers	Cultivation; outside jobs	0.879	10
4. Gadaria	12	83	Shepherds	Cultivation; outside jobs	2.351	5
5. Dhobi	4	27	Washermen	Cultivation; agricultural labor	0.767	0
6. Teli	16	92	Oil Pressers	Cultivation; agricultural labor	1.062	4
7. Passi	15	85	Mat makers	Outside jobs	1.658	6
8. Jatab	19	118	Leather workers	Cultivation; agricultural labor	1.84	1
9. Others	7	47	Miscellaneous	Miscellaneous	0.363	2
Entire village	143	960			2.70	47

Note: Except for the "others" category, this list of castes follows a tentative hierarchical ranking, with Thakur at the top and Jatab at the bottom (for details, see Bliss and Stern 1982). Dhobi and Teli households are Muslim. Total village land amounted to 2,596.1 bighas (405.6 acres) in 1983–84.

Source: Authors' data, available for a nominal reproduction charge upon written request to the authors.

f the 143 households being put in the same or adjacent categories. This high ompatibility supports the view that relative positions in terms of apparent rosperity are in many cases unambiguous.

It is not, of course, easy to spell out precisely what the basis of one's impresons about the prosperity of different households is, even when those impresons are quite strong. To a great extent prosperity is associated with "lifestyle": e quality of housing, food, and clothing, the possession of durable goods, the nsumption of luxuries, and so on. There are, however, some difficulties with is association, which account for many of the discrepancies between the classiations of Drèze and Sharma. Two of these difficulties deserve special mention.

First, one must recognize the distinction between consumption or lifestyle and come or commodity command. A good illustration of this difference is proded by household 226, classified as modest by Drèze but rich by Sharma. hroughout this article, the first digit of a household identification number dicates the caste of the household, as detailed in table 1. The identification mber of Thakurs, for example, begins with the digit 1, Muraos with digit 2.) ikkay (226) is an old and childless man who lives alone and whose income mes exclusively from the rent of his land. He owns 25 bighas (about 4 acres) land and, under the standard terms of sharecropping in Palanpur, this would ve him a per capita income well above the Palanpur average. Bhikkay's conmption patterns, however, are those of a poor man: his small mud house is apidated and empty, his clothes are tattered, and he eats barely enough to rvive. His lifestyle seems to have led Drèze to classify Bhikkay as modest, hereas Sharma classified him as rich in view of his relatively high income. Later was learned that the motivation behind Bhikkay's high savings rate was his sire to build a small temple. The classification of such households for which come and lifestyle measures differ widely can be problematic.

Second, intrahousehold inequalities of lifestyle may cause classification difficulties. A good example is provided by household 705, which consists of a dow (Champa), her adolescent son (Raj Kumar), and a small daughter. Raj mar works in a steel-polishing workshop in Moradabad, and his earnings are main source of household income. Polishing steel is hard work, but under piece rate system it yields relatively high daily wages (about Rs20), and Raj mar himself leads the relatively privileged life of those who have daily access a substantial sum of cash. But his mother Champa is comparatively neglected d leads a severely deprived life. She even engages in wage labor, a symptom of ere deprivation in Palanpur. This household has been classified as modest by èze and as very poor by Sharma.

The final stage of the classification exercise consisted of grouping the houseds from the seven fractiles into deciles of equal size, integrating the separate nkings produced by Drèze and Sharma. A more detailed account of the entire ssification exercise, along with a further discussion of the difficulties involved such an assessment, is provided in Drèze (1988).

The second measure of living standards employed here, current income, is a

natural and widely used prosperity indicator. The difficulties in defining income, both in theory and in practice, which can be substantial in developed countries (see Atkinson 1989, chap. 1), are much more troublesome in developing countries. First, there is the problem of the time period used. Yearly income in agricultural communities is a sensible concept given the seasonal cycles in agriculture. But the year is in some respects too long, because seasonal hardship can be severe, and is in other respects too short, because there are considerable year-to-year fluctuations, so that income in one year may not reflect the long-term standard of living. Related to the problem of time period is the problem of inputs. Like other production activities, agriculture involves inputs which go in in one period and outputs which come out in another. How should the inputs be debited against outputs? In some cases inputs will obviously be associated with outputs in a particular season, but in the case of investment in water resources, for example, the inputs are used over a much longer time period. Also, households may use the same inputs for both production and consumption purposes. For example, bicycles and carts can be used to go to town for shopping simultaneously for consumption goods and productive inputs. A third problem is the family unit. Village households may number from one to thirty persons and vary considerably in composition. Should one use equivalence scales to standardize households? Are there important consumption goods which are public goods within the household? Different resolutions of the problems of relevant time period, input accounting, and household heterogeneity will lead to different measures of income. And different measures of income can lead, as we shall show, to very different conclusions regarding the incidence and severity of poverty.

Besides income, there are a number of other dimensions of standard of living one would like to measure. Expenditure or expenditure on food may be a more reliable measure of living standards than income, but for Palanpur, expenditure data were not collected. Land and other assets are important indicators of wealth and earning power. Finally, health and nutrition are crucial aspects of the standard of living often not well captured by income measures (see, for example, Drèze and Sen 1990).

Our notion of current income is intended to measure the returns to land, labor, and other household assets, but due to the theoretical and practical difficulties mentioned above, current income does not measure this perfectly. In addition, to retain comparability between time periods, we have used measures which do not go beyond the data availability for early survey years. Current income is defined here as gross revenue minus current input costs, which include payments for hired labor but not family labor.

We have experimented with two further measures of income. One of these, "normal income," takes account of agricultural fluctuations by replacing current output with the "normal" output appropriate for the particular year. Insofar as expectations are derived from an averaging of past harvests, normal income could correspond to average incomes from previous years. This measure is not

e main focus of this article, and the reader may consult Lanjouw and Stern 989) for a more detailed discussion. We also construct a "permanent" income easure, which is an unweighted average of real per capita income across all ur years of the survey. Experiments with the use of equivalence scales have not d to dramatically different results in the analysis of income distribution (see njouw and Stern 1989).

II. Poverty and Household Characteristics

There are different ways of defining and measuring "poverty", even if we trict ourselves to the conventional view of poverty as a lack of commodity mmand. The characteristics of poor households may therefore vary depending the measure chosen. We shall be concerned both with the identification of the aracteristics of the poor and with the robustness of these characteristics with pect to changes in the definition and measurement of poverty. Throughout s section the unit of analysis will be the household as opposed to the individ-l, although household size will be taken into account.

Unless otherwise stated, the term "poor" is used to describe those households ty nine in all) which are located among the poorest four deciles of the popula-n in terms of the particular measure of standard of living used. The notion of verty is, therefore, a relative one, but it does correspond to a widely used verty line (Dandekar and Rath 1971), the use of which would result in 40 cent of Palanpur households being classified as poor in 1983–84.[1]

Apparent Prosperity and Current Income

Current income is often used to measure poverty and to identify a target pulation for poverty alleviation programs. (See Drèze 1990a on income and gibility conditions of the Integrated Rural Development Program, IRDP.) It is interest, then, to compare the rankings of different households in Palanpur ng 1983–84 per capita income with rankings using the apparent prosperity ssification which was based on personal observation. Differences between the o rankings may illuminate the inadequacy of using current income alone as a asure of standard of living. This comparison is illustrated in table 2, which ws the position of each of Palanpur's 143 households on both the apparent sperity scale (row index) and on the per capita income scale (column index), h scales having been divided into deciles. It is clear that there are substantial erences between the rankings obtained under each method. These reflect tly the inaccuracies inherent in each method of assessment, but also some real

An all-India poverty line for rural areas proposed by Dandekar and Rath (1971), was Rs15 per on, per month (at 1960–61 prices). Relative prices between Uttar Pradesh and India as a whole in –64 were used to obtain a poverty line of Rs11.3 for Uttar Pradesh in 1960–61 (see the contribution hattacharya and Chatterjee in Bardhan and Srinivasan 1974). Inflating 1960–61 prices to the 1983– vel, using the Consumer Price Index for Agricultural Labourers (CPIAL), an annual per capita poverty of Rs718 was obtained.

Table 2. *Comparison of Current Income and Apparent Prosperity Rankings of Standard of Living*

Apparent prosperity decile	*1983–84 Current income decile*									
	First (poorest)	*Second*	*Third*	*Fourth*	*Fifth*	*Sixth*	*Seventh*	*Eighth*	*Ninth*	*Tenth (wealthiest)*
First (poorest)	608 711 804 612 714 817 613 801	501 808 611 812 710	307	610	802	609				
Second	303 810 814	809 818 819	712 815 905	713 806 807	901				705	
Third	803	309 315 403	128 409 816	302 811	504 606 703	301	615			
Fourth	113 903	605 617	117 308		407	115 131	103 120 601	114		304
Fifth	715	813	105 406 223	129 [404] 218	503 805	402			123	

Sixth					100 [607] 124 305	107	216 311	104 602 306 312	604	206 707
Seventh	122		212	126		110 909 412 603	109 704	411	102 106 310	214
Eighth	225			[121] 203	215 222	127	[202] 210 906	204 209 902	708 709	
Ninth						207	119 205	226 614	111 408 211 701 401	220 907 405 702
Tenth (wealthiest)				112		125 410	[221]	[101] [213] 502	[224]	[116] 208 118 217 201 706

Note: Current income is ranked on a per capita basis. Each column of the table represents one decile of the scale of "current income," and each row represents one decile of the scale of "apparent prosperity," with deciles ranked in increasing order of affluence. Cell entries are household identification numbers. The number of households in the poorest decile for each measure is 17, and in all other deciles is 14. Households with 3 or fewer members are in bold type. Households with 12 members or more are in square brackets.

Source: Authors' data, available for a nominal reproduction charge upon written request to the authors.

differences in the underlying concepts of prosperity and poverty. One of the most obvious and important contrasts arises from the fact that current income varies widely from year to year. As a result, per capita income in 1983–84 can be quite a poor indicator of both the long-run earning opportunities of a household, and of its living standard in that year.

Among the factors that account for the short-run instability of income, the quality of the harvest is one of the most influential. The year 1983–84 was one of poor harvest in Palanpur (with yields 35 percent below average) but good harvest in Uttar Pradesh as a whole, resulting in low output prices. This combination depressed incomes for households which derive a substantial part of their earnings from farming. Close inspection of table 2 and complementary land ownership data reveals that for the majority of the households cultivating 10 bighas of land or more, 1983–84 per capita income is somewhat low relative to apparent prosperity. The incomes of Murao farmers are particularly depressed, as farming accounts for a large part of total income for this cultivating caste. Of the 23 Murao households cultivating more than 10 bighas, 16 lie below the diagonal in table 2, indicating that their per capita income ranking understated their apparent prosperity. In only 3 out of the 23 cases did per capita income overstate the prosperity of Murao households.

Fluctuations in the quality of the harvest for the village as a whole are compounded by fluctuations for individual farmers related to factors such as pests, management errors, and risk-taking behavior. An extreme example is provided by household 122, which had a negative income in 1983–84. This household owns a large amount of land, excellent draught animals, and a variety of consumer durables, including a good house. But the household experienced a disastrous harvest in 1983–84, resulting in a negative income for that year. Current income clearly understates this household's true prosperity. Other important sources of instability of short-run income include fluctuations in prices and wages (with, for example, real agricultural wages being at a temporary peak in 1983–84), temporary illness (household 113), and job search (household 715).

In regard to inaccuracies of assessment, we have already commented on a number of difficulties, but two further problems deserve mention. First, our measure of current income excludes income earned from illegal activities (for example, stealing coal from passing trains and selling liquor) as well as interest income. The latter leads to some systematic underestimation of the incomes of richer households and overestimation of the incomes of heavily indebted households. Among the 8 households which are positioned in the richest decile in terms of apparent prosperity but *not* in terms of per capita income, *all 5* of the non-Murao households are moneylenders. One of these households (410) is also notorious for earning large sums of money from illegal activities, especially selling liquor. Other omissions in the measurement of income, such as the imputed rent of houses, will also have led to some underestimation of richer households' incomes.

The second problem relates to the treatment of household size. As can be seen from table 2, there is a systematic tendency for the scale of apparent prosperity to boost the position of large households (in square brackets), and reduce the position of small ones (in bold type), compared with the scale of current income. The reason for this is not obvious, and two nonexclusive possibilities come to mind. First, it could be that perceptions of lifestyle are influenced more by total household income than by per capita income, and are biased upward, especially for large households, by intrahousehold inequalities. Household 224, for example, is widely regarded as one of the most well off in the village, and its endowment of land and other assets in 1983–84 was indeed very impressive: it possessed, for instance, the only functioning tubewell in the village, the only tractor, and the only flour mill. The head of the household, Bhupal (who rarely works himself) smokes cigarettes, travels, and gives generous feasts at marriages. This exceptionally large household contains no less than 35 members, however, and the other 34 members rarely smoke cigarettes or travel, yet this household is placed in the richest decile on the prosperity scale.

The second possibility is that the observed bias arises from the failure of per capita income measures to capture the effects of economies of scale and adult equivalence. There are obvious economies of scale involved, for instance, in the ownership of a number of consumer durables such as handpumps, radios, and bicycles. The use of adult equivalence scales would lead to upward corrections of the incomes of large households, where the proportion of children tends to be higher than average.

It is clear from this discussion that apparent prosperity and current per capita income each have strengths and weaknesses as indicators of the standard of living. What should be stressed, perhaps, is that defining "poverty" simply in terms of current income can lead to rather unsatisfactory and counterintuitive classifications. Consider, for instance, the set of households falling in the richest three deciles of the apparent prosperity scale in table 2. This group contains households which appear quite low in the current income scale. It includes Dumber (410), the liquor dealer, and Gulabo (112), the leading moneylender in the village. It also includes a number of households whose incomes were temporarily depressed by a bad harvest, illness, or job search. Measured income in one year does not reflect the long-run prosperity of these households.

The observation that current income has major deficiencies as an indicator of prosperity is hardly surprising, but it has far-reaching policy implications given the use of current income in targeting government assistance to vulnerable households. Even in the absence of measurement errors, the benefits of such schemes would accrue to the "transiently poor" as well as to the "chronically poor." Furthermore, there are good reasons to believe that the transiently poor would, in general, have a greater chance of being selected than the chronically poor. The transiently poor usually have more influence, are better educated, and can incur the costs of search and bribery more easily, in addition to the fact that

government officials themselves often prefer to deal with the less poor among eligible households. The use of current income as the criterion for eligibility for public support is problematic, and alternatives must be carefully considered.

Current Income and Permanent Income

An obvious remedy to the problem of short-run fluctuations in income is to average income over several years. This requires panel data on incomes, which tend to be rare for rural India. In the case of Palanpur, income data are available for the years 1957–58, 1962–63, 1974–75, and 1983–84 (authors' data, available for a nominal reproduction charge upon written request to the authors), and our measure of permanent income is the average over these survey years. Not all households were present in all four survey years, having migrated in after the earlier surveys or having been absent during one or more survey years. For these households, permanent income is the average of income in survey years during which they were present. Incomes were made comparable by deflating with the appropriate price index. Table 3 compares the ranking of households in terms of 1983–84 per capita income with their ranking in terms of permanent per capita income.

An obvious difficulty in interpreting differences between current income and a measure of permanent income based on such a long period of time is that for any particular household, current income can deviate from permanent income either because of a long-run change in economic status (caused, say, by the loss of an earning member) or because of a short-run fluctuation (for example, due to a poor harvest). In spite of this difficulty, some interesting observations do emerge from table 3.

First, access to employment opportunities outside the village seems to have played a major role in upward income mobility. Of the 11 households which were not in the richest decile on the permanent income scale but which moved into the richest decile on the 1983–84 per capita income scale, 8 had at least one (4, more than one) member employed in the formal sector outside the village—in spinning factories, railways, teaching, and so on. Six of these eight households have *pacca* (permanent) jobs, with secure employment and comparatively high monthly salaries. As table 3 shows, regular employment outside the village also accounts for a large part of upward mobility at other levels of income. To some extent, this upward mobility results from the short-run downturn in farm incomes in 1983–84. However, much the same conclusion is reached if we compare permanent income with apparent prosperity in 1983–84 instead of current income.

Second, a number of the more dramatic cases of downward mobility are clearly related to the loss of income-earning household members. In some cases (113, 225), the loss is temporary, and due to illness or accident. In other cases (613, 711, 712, 714), the loss is permanent, due to death or permanent disability (see Drèze 1990b on the connection between widowhood and downward mobility in Palanpur).

Third, table 3 confirms previous statements on the relationship between caste d poverty. A very high incidence of poverty emerges among Jatabs, all of ich are in the poorest 40 percent by at least one of the two income criteria. nilarly, a high proportion of large Murao farmers among the unambiguously h households is noticeable. Downward mobility is discernable among Thakur useholds, with only eight of them below the diagonal (five due to access to tside employment). It is not likely that all this downward mobility is attributa- to the bad harvest, because cultivation income is not particularly important Thakur households. This observation fits with the widely held view in lanpur that the relative economic position of the Thakur caste has deterio- ed in the last few decades.

Poverty and Household Characteristics

This section investigates the incidence of poverty among households in rela- n to economic, demographic, occupational, and caste characteristics. Some evant information is presented in table 4, where a number of different house- ld groups are considered. The first column indicates the proportion of house- lds which would be included in the poorest 40 percent of households under apparent prosperity criterion, and the second and third columns denote the oportion of households in the poorest 40 percent of the population according the current income and permanent income classifications, respectively. Note t in this exercise permanent income refers to the average of 1974–75 and 83–84 incomes only, as the household characteristics considered apply to 83–84 and some are not likely to be long term.

It is reassuring that different approaches to the assessment of poverty give oadly similar indications of the relative incidence of poverty in various kinds household groups. For example, both the apparent prosperity and the current come criteria suggest that households without land, households with no fit ult male, households headed by widows without a fit adult male, and house- lds of the Jatab caste are substantially more vulnerable than average. Sim- rly, both measures show that there is relatively little poverty among house- lds with access to regular jobs, Thakurs, Muraos, and joint families (in which others and other relatives live together). The criterion of rural poverty income plies similar levels of poverty for most household groups, except those defined terms of transient demographic characteristics. For example, widow-headed useholds without a fit adult male in 1983–84 was a highly vulnerable group in t year according to both the apparent prosperity and current income criteria, t not particularly so in terms of permanent income. This is hardly surprising, nce most of these widows would have been living with their husbands in 1974– . Similarly, households with regular jobs in 1983 were relatively unlikely to be nong the poor in that year in terms of apparent prosperity and current income, t faced close to the village-average risk of poverty (40 percent) according to e permanent income criterion.

Depending on the classification used, the risk of poverty among landless

Table 3. *Comparison of Permanent Income and Current Income Rankings of Standard of Living*

1983–84 Current income decile	*1957–84 Permanent income decile* First (poorest)	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth (wealthiest)
First (poorest)	303 817 612 903 801	810 814	608	613 803 804	711 714 715	113			122 225	
Second	309 617 813 315 808 501 812	605 809 819	403 611 818			710				
Third	307 905	117 816	223 308	227		128	406 815	105 409	212 712	
Fourth	806	129 302 811	219	218	121 807	203 404	112 713 126 610			
Fifth	607 805	503 802	407 504 703	305 901	222 606			124 215	108	

Sixth			[illegible]	[illegible]	[illegible] 909	[illegible] 412	110 115			
Seventh		311 601	615	120	704	906	216	103 205 109 221 119	202	210
Eighth			312 411	114 614 306 602		902		502	101 209	104 226 204 213
Ninth					111 604	310 705 708	123 224	106 401	222	102 709 408 701
Tenth (wealthiest)				304	405	220 702	118	116 907	201 706 206 214	208 217 707

Note: Rankings are of per capita income. Each column of the table represents one decile of the scale of "permanent income," and each row represents one decile of the scale of "current income," with deciles ranked in order of increasing affluence. Cell entries are household identification numbers. The number of households in the poorest decile for each measure is 17, and in all other deciles is 14. Households with at least one member in a regular outside job are entered in bold type.

Source: Authors' data, available for a nominal reproduction charge upon written request to the authors.

Table 4. *Poverty Risk for Different Household Groups*

Household characteristic	*Proportion of households with stated characteristic classified as poor*			*Total number of households with stated characteristic*
	Apparent prosperity	*Current income*	*Permanent[a] income*	
With regular job	0.24	0.13	0.30	47
Landless	0.70	0.44	0.55	27
Landless without regular job	0.76	0.52	0.64	17
Doing agricultural labor	0.76	0.64	0.59	42
Landless and doing agricultural labor	0.99	0.63	0.54	11
Without fit adult male	0.66	0.55	0.39	18
Landless without fit adult male	0.55	0.43	0.57	7
With widow	0.45	0.48	0.42	33
Widow without fit adult male	0.66	0.66	0.44	9
Joint family	0.19	0.21	0.40	37
Thakur	0.27	0.30	0.33	30
Murao	0.00	0.26	0.22	27
Dhimar	0.61	0.46	0.38	13
Gadaria	0.25	0.33	0.16	12
Dhobi	0.50	0.25	0.75	4
Teli	0.68	0.43	0.50	16
Passi	0.46	0.40	0.40	15
Jatab	0.89	0.89	0.73	19
Other	0.43	0.28	0.71	7
All households	0.41	0.41	0.41	143

a. Permanent income is calculated as the average of 1974–75 and 1983–84 per capita income.

Source: Authors' data, available for a nominal reproduction charge upon written request to the authors.

households ranges from about 75 percent above the village average risk (using the apparent prosperity criterion) to roughly the same as the average (using the current income criterion). The link between poverty and landlessness is therefore not so strong as might have been imagined. This may result from the heterogeneity of the landless group, which includes households with widely divergent economic opportunities. In Palanpur we can identify at least three subgroups of landless households which one would not expect to be particularly poor. These are (1) households with no land but with access to regular employment outside the village; (2) households from castes traditionally providing services not requiring the use of land, for example, carpenters, barbers, potters, and sweepers; and (3) households consisting of adult sons who live separately from their parents and have no legal title to land but who are entitled to cultivate their fathers' land.

Households without a fit adult male are also thought to be particularly vulnerable to poverty, especially in villages such as Palanpur where female employment and land rights are severely restricted. But the average risk for these households is above the village average by at most 65 percent (using the apparent prosperity criterion). Once again, this is a heterogeneous group; the means through which some of these households escape poverty in Palanpur include the ownership of milch animals (household 409), access to a sedentary but secure job (103), and

nittances from a male family member who lives outside the village and is refore not counted as a household member (503, 907).

Widows are another group considered particularly vulnerable, but again their k of poverty as measured in table 4 is perhaps not as high as one would dict. Once again this is a heterogeneous group which includes a number of y deprived households but also Gulabo (112), who is the largest moneylender Palanpur and is entered in the richest decile of the apparent prosperity classi- tion. The vulnerability of widows in Palanpur is strongly affected by the sence or absence of an adult son. Through the practice of patrilocality, a man in Palanpur normally joins her husband's village immediately after mar- ge and is generally unable to appeal to her own relations when she becomes dowed; in-laws in Palanpur rarely provide any support to a widow. Employ- nt opportunities in Palanpur are very limited for women: the Muslim custom purdah prohibits a woman from uncovering her face in public, and related ctices restrict her movements. Thus a widow has great difficulty in earning ome by hiring out her labor. As a consequence of these factors, usually only a low with adult sons can be confident that she will receive some support.

Indicators of poverty incidence by caste broadly confirm the patterns dis- sed earlier: the incidence of poverty is very high among Jatabs, and relatively among Thakurs and Muraos. Poverty among Muraos is practically nonexis- t, though current incomes reveal some poverty in this group mainly due to the harvest. Although a considerable amount of change has taken place at the of the economic and social hierarchy, little progress has been made in Palan- by the lower castes, especially the Jatabs. Among this group, poverty re- ins endemic. This is a reflection not only of poor endowments of productive ets, but also of low educational standards and vulnerability to caste-based crimination resulting in, among other things, little access to any kind of ular employment outside the village.

Households with at least one member involved in agricultural labor are quite ely to be included among the poor. To be employed as a manual worker for other farmer is generally considered to be demeaning and would not be under- ken if other earning opportunities were available. Furthermore, wages offered low and employment is irregular. It is an option of last resort, and thus those o take it are likely to be the poor. Many of the agricultural laborers are abs, and any attempt at disentangling the separate contribution of these racteristics requires a multivariate analysis.

III. The Determinants and Correlates of Poverty

The analysis of the preceding section can be extended and formalized using nple econometric analysis of the determinants of poverty. The problem of ecifying exogenous variables is both important and difficult here. We have lected two types of variables in this category. The first type consists of three mmy variables characterizing the household's asset or labor market position.

percent in 1983–84. Using the same absolute poverty line in real terms, 46 percent, 49 percent, and 13 percent of the population were poor in 1957–58, 1962–63, and 1974–75, respectively. From this perspective it appears that there was a sharp decline in poverty between 1962–63 and 1974–75, but that this was followed by a marked rise between 1974–75 and 1983–84. The quality of harvest is no doubt exerting a strong influence here with a good agricultural year in 1974–75, followed by a bad year in 1983–84.

Whether the poor in any one year are always the poor is an important question which merits exploration. In a study at the national level, Gaiha (1989) found that only about half the poor in India in 1968 were chronically poor in that they were also poor in 1969 and 1970. Our attitudes toward and suggested remedies for poverty will be affected by the degree to which poverty is a sustained or temporary condition. The question of poverty duration is particularly difficult or impossible to address when using large-scale survey data which do not attempt to follow individuals or households over time (see Bardhan 1989). Despite the advantages of the apparent prosperity measure of poverty, it is available only for 1983–84, and so cannot be used here. We will consider instead the movements over time of households' actual incomes. Before assessing and interpreting the relative position of a household in different years, we will first examine the different distributions of income in those years.

Changes in Income and Inequality in Palanpur

Changes in the distribution of income in Palanpur between 1957 and 1984 can best be viewed against the background of a growing population, substantial change in agricultural practices, and a process of closer integration with the outside world. In table 6 we see that the population of Palanpur almost doubled

Table 6. *Broad Indicators of Economic Change in Palanpur*

Indicator	*1957–58*	*1962–63*	*1974–75*	*1983–84*
Population	528	585	757	960
Number of households	100	106	112	143
Village real income (Rs)	85,166	94,712	208,024	186,402
Real income per capita (Rs)	161.3	161.9	274.8	194.1
Gini coefficient for income	0.336	0.390	0.253	0.307
Price index (1960–61 = 1.00)[a]	1.07	0.92	3.78	5.28
Agricultural daily wages, real (1962–63 = 100)	123	100	123	158
Food purchasing power (kg wheat per day)	2.5	2.25	3.1	5.0
Index of real wages for regular outside jobs	n.a.	100	122	193
Wheat yields, actual kg per bigha[b]	40	40	114	97
Wheat yields, normal kg per bigha[c]	40–50	50	100	150–60

n.a. Not available.

a. The price index is the consumer price index for agricultural labourers (CPIAL), which is taken from the *Bulletin of Food Statistics* for the relevant years. See Lal (1976) for the price index for 1957–58.

b. An acre = 6.4 bighas.

c. "Normal" yields correspond to the expected yield for Palanpur without advanced knowledge of each year's harvest.

Source: Authors' data, available for a nominal reproduction charge upon written request to the authors.

between 1957–58 and 1983–84, and the number of households also rose, particularly between 1974–75 and 1983–84. This was the result of net migration into the village, as well as a process of families splitting over time as married sons separated from their parents.

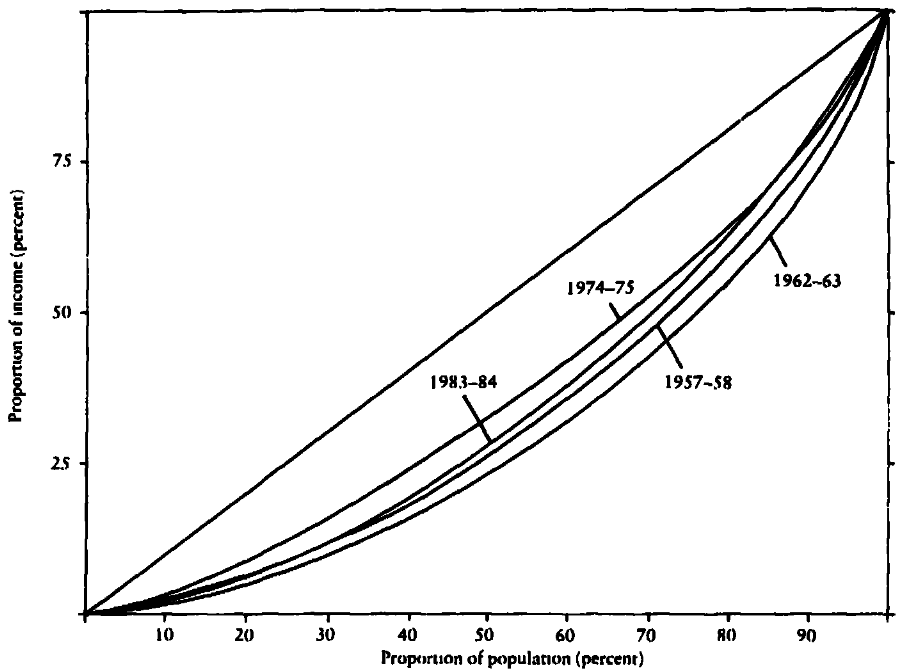
On average, the rate of growth of incomes in Palanpur was similar to that recorded for India as a whole. Average real per capita incomes in 1960–61 prices rose from Rs161.3 in 1957–58 to a peak of Rs274.8 in 1974–75, then fell back to Rs194.2 in 1983–84. Income in each of the survey years will depend on the agricultural harvests in the respective years. In comparing actual wheat yields with normal yields in each year, we note that 1957–58 seems to have been an average agricultural year, 1962–63 bad, 1974–75 rather good with yields perhaps 15 percent or so higher than average at that time, and 1983–84 a bad year with yields 35 percent or so below the average. On the basis of the perceived normal wheat yield in 1983–84 of 150–60 kilograms per bigha, normal income per capita in 1983–84 was probably about Rs240–50 (see Lanjouw and Stern 1989), and the annual growth rate of normal per capita income over the 26 year period was approximately 1.9 percent. This is not far from figures for all of India (World Bank 1980, 1983).

Inequality of incomes in Palanpur was not constant across the four survey years, nor did it follow a monotonic path over time. Between 1957–58 and 1962–63, the Gini coefficient for individual incomes (calculated by dividing household income by the number of household members and allocating to each member the per capita income) rose from 0.336 to 0.390, which may be regarded as a substantial increase in inequality. Looking at the Lorenz curves in figure 1, we see that the curve representing 1962–63 lies below that of all other years, implying that a whole range of inequality measures would present the distribution of income in 1962–63 as the most unequal (Atkinson 1970). Between 1962–63 and 1974–75, the Gini coefficient fell from 0.390 to 0.253, and then rose again to 0.307 in 1983–84, reflecting a decline and a subsequent rise in inequality.

Atkinson index parameters, which give a greater weight to changes in income among the poor when calculating inequality, indicate that inequality was greater in 1983–84 than in 1957–58. This can also be seen in figure 1 at the lower end of the income scale, where the curve for 1983–84 lies below that for 1957–58 (and for 1974–75). Adjustments to income using equivalence scales in order to correct for different needs according to age and gender were attempted, but had little effect on the calculations of inequality and are therefore not reported here. Attempts to adjust agricultural incomes for "good" and "bad" years by using normal income also had little effect on calculations of inequality (see Lanjouw and Stern 1989).

Gini coefficients for the distribution of land were calculated, as with income, attributing an equal proportion of a household's land to each member. The Gini coefficient for 1983–84 was 0.503 (based on 960 observations), compared with 0.495, 0.472, and 0.468 for 1957–58, 1962–63, and 1974–75, respectively

Figure 1. *Lorenz Curves for Individual Incomes in Palanpur*



Note. Individuals in the population are each allocated their household per capita incomes.
Source: World Bank data, available for a nominal reproduction charge upon written request to the author.

(based on 528, 585, and 757 observations). These figures suggest a gradual decline in landholding inequality from 1957–58 through 1974–75, with a substantial increase in inequality in 1983–84.

Much of the difference in the distribution of land between the survey years is eliminated, however, if we evaluate the distribution of land between "dynasties": we consider only those households which were present in all four survey years and merge those households which split over the twenty-six-year period. Given this aggregation, the observed Gini coefficients from 1957–58 to 1983–84 are 0.477, 0.456, 0.452, and 0.443 (based on 450, 497, 593, and 822 observations). Thus aggregating land across families actually reverses the measured inequality: landholdings across these extended families became *more* equal over the four periods. This supports the view that the main determinant of the changes in the distribution of land over time has been the phenomenon of household splits. The market for land in Palanpur is not very active, and land sales, most of which were by rich households, played a minor role in the changing distribution of land (Drèze and Stern 1986).

In Palanpur, the Green Revolution initially brought a reduction in income inequality. By 1983–84, however, there was an increasing disparity in the amount of land cultivated per household, the result of large landholders (a

group which now included a larger proportion of Muraos and hence a larger proportion of serious and capable farmers) taking more land under tenancy from the middle and small landholders. This resulted in increasing income inequality. The adverse cultivating conditions in 1983–84, which led to a greater dispersion in yield per acre as well as a reduction in the mean, also contributed to a widening of the distribution of agricultural income.

The other major influence on income inequality (again see Lanjouw and Stern 1989) came from the expansion of outside jobs. In the earlier survey years, outside employment was relatively uncommon and generally held by less well off individuals, often from lower castes. By 1983–84, the higher castes were more prominently represented, particularly in the new, better paid positions, and income from outside jobs became a source of inequality as significant as agricultural income.

Income Mobility

The data for the four surveys were collected in such a manner that individual households could be followed through the whole period. In tables 7, 8, and 9, we present transition matrixes showing the movements of individual households between deciles of the income distributions of adjacent survey years. For instance, household 571900 moved from the first (poorest) decile of the income distribution in 1974–75 to the second decile of the income distribution in 1983–84 (table 7). Note that household numbers in these tables are not the same as those in earlier sections, as they are constructed to reflect not only caste (first digit) but also household splits and departures from the village. (If a household split between 1974–75 and 1983–84, the last digit of the household number will be strictly between 0 and 9; if the household split between 1962–63 and 1974–75, the second to last digit will be between 0 and 9, and so on. If a household was not present in the village for a survey year, the corresponding entry in the appropriate of the last three digits is 9.) Not all of the 143 households from 1983–84 are found in each transition matrix, because households came into existence in different years.

A low degree of mobility over time in terms of current income would be represented in these transition matrixes by a concentration of households along the diagonal. It is clear that this is not the case in Palanpur. The percentage of households located on the diagonal of each transition matrix is about 12–14 percent. Between 1957–58 and 1962–63, 48 percent of all households were either on the diagonal or one adjacent decile. This percentage declined to 34 percent between 1962–63 and 1974–75 and to 33 percent between 1974–75 and 1983–84. Even those households identified as being poor in 1983–84 (those in bold type in the matrixes) are quite widely scattered around each matrix.

Although the mobility pictured certainly appears to be rather high, we must remember that we are here using the current income measure. Although arguably quite comprehensive, it fails to capture many important features of the standard of living. Current income may be considerably more variable than the underlying living standards of households in Palanpur. The current income of

Table 7. *Transition Matrix of Per Capita Income Distribution between 1974–75 and 1983–84*

1974–75 income decile	1983–84 income decile									
	g = 1	*g* = 2	*g* = 3	*g* = 4	*g* = 5	*g* = 6	*g* = 7	*g* = 8	*g* = 9	*g* = 10
g = 1		571900	809010	810002	810001	605030	605020	572900 210000	605010	403020
g = 2	813001	301000 805002	809020 805001	816000	813002 701000 608000		604000	218000	401010 307200	
g = 3	306002 815000	606200 814000 804000 807002	807001	310002 704100 106000	408000 910001		310001	910002		306001
g = 4		601001		803000 407000 219000 309000	110021	307010	206020	307102 603000	601002 403010 110022	
g = 5	108001 108002 607020	402001	404000	109002	201000	305000 402002 116020	109003	109001		706200 116010 271900

$g = 6$				115020		101000	906001 102000 111031	204030	704200 303000	220000 906002 105000 703000 111032
$g = 7$	606100		808000 216000	113020	207000	110010	209000	171900	161000	103000
$g = 8$	602003 802001 802002	208010 812000	206010	214100		208020 602001	602002	702000 261010	205000	
$g = 9$		901000	221000	607010	401022	401021 202000	115010 214300		111020 705110	406000 204010
$g = 10$	573900				211000 117000	104000	203000 111010	114000 214400 113010		214200 215000 204020

Note: $g = 1$ represents the bottom 10 percent in income per capita terms. Correspondingly, $g = 10$ represents the top 10 percent. Cell entries are household identification numbers. The 59 households which are poor in 1983–84 by the apparent prosperity criterion are in bold type

Source: Authors' data, available for a nominal reproduction charge upon written request to the authors.

Table 8. *Transition Matrix of Per Capita Income Distribution between 1962–63 and 1974–75*

1962–63 income decile	*1974–75 income decile*									
	$g = 1$	$g = 2$	$g = 3$	$g = 4$	$g = 5$	$g = 6$	$g = 7$	$g = 8$	$g = 9$	$g = 10$
$g = 1$		80500	80400	80300 30710		10500	21600 60610	76100		10400 20300
$g = 2$		81300 60800		30900		10200	10300	70200	90100 21430	21440
$g = 3$		30720 30100	40800 30600 81500	60100	30500			81200 20500	40600	11700
$g = 4$	40302 81000	70100 60400	60620 81400	40301 60300	10800		16100			
$g = 5$	60502 60503 60501 26102		70410		20100	30300	20700 80800	21410 60200 26101		21420

$g = 6$	11200			20602	[illegible] **60702** 11601 11602	70300 22000		20601 **80200**	20200 **60701**	11400
$g = 7$	**80901**	80902	**80700** **31000** **91000** **10600**	21900	**40200** 70620	**90600** 11502			11501	21100
$g = 8$		**81600** 21800		40700	40400		20900 11302		70510 11102	11101 11301
$g = 9$	21000	40101				10100 **70420**	40900	20801 20802	**40102** 22100	
$g = 10$				11002		20403	11001		20401	20402 10700 21500

Note: $g = 1$ represents the bottom 10 percent in income per capita terms. Correspondingly, $g = 10$ represents the top 10 percent. Cell entries are household identification numbers. The 59 households which are poor in 1983–84 by the apparent prosperity criterion are in bold type.

Source: Authors' data, available for a nominal reproduction charge upon written request to the authors.

Table 9. *Transition Matrix of Per Capita Income Distribution between 1957–58 and 1962–63*

1957–58 income decile	*1962–63 income decile*									
	g = 1	*g = 2*	*g = 3*	*g = 4*	*g = 5*	*g = 6*	*g = 7*	*g = 8*	*g = 9*	*g = 10*
g = 1	8040	6080 9040 2120	3060	6040	7100	1090 1120				
g = 2		1030	3010	8100 6030		7030 2200	3100 7062 8090		7061	
g = 3	3071 8050	7020	1170 3072 8120	4030			8070			1070
g = 4	8030		4060 6010 4080 8150	2170 3040	3030 6020				7090	
g = 5	6061 1050	8130	3050	6062 7010	2010	2060 8020	2190 4020			

$g = 6$		3090		8140	2070 2080		2110 1150 9060	1130 1110		
$g = 7$	1040	9010	2050		6050 7071	2020 6070			4090 7042	
$g = 8$			2143 2144		2141 2142	1160 1140	1060	2090	4010 4070 1010	7080 2040
$g = 9$								4050 7110 7070 8160	2130 2210	1100 5010
$g = 10$	2030	1020		1080				4040 7051 2180	2080 7052 2100	2150

Note: $g = 1$ represents the bottom 10 percent in income per capita terms. Correspondingly, $g = 10$ represents the top 10 percent. Cell entries are household identification numbers. The 59 households which are poor in 1983–84 by the apparent prosperity criterion are in bold type.

Source: Authors' data, available for a nominal reproduction charge upon written request to the authors.

cultivating households will be sensitive to the quality of their harvest in different years. Further, shocks to households, such as temporary illness of income-earning members, may contribute to significant variation in current incomes between years.

Despite the appearance of high mobility, it is significant that among the fourteen households which belonged to one of the poorest three deciles of the per capita income scale in *both* 1974–75 and 1983–84, all but one were regarded as poor in terms of the apparent prosperity criterion for 1983–84. This appears to lend some further support to the claim that the apparent prosperity measure is successful in identifying those households in 1983–84 which are experiencing sustained deprivation.

Of the 49 households which were poor by the criterion of apparent prosperity in 1983–84 and which were already present in the village in 1974–75, 29 households were in the poorest 40 percent of the current income distribution in 1974–75. It thus appears that, in spite of the high degree of mobility found in the income space, low current income in 1974–75 is a good predictor of low apparent prosperity in 1983–84. Because 1974–75 was a good year agriculturally, when bad farming practices were less severely penalized, and tenancy exerted an equalizing influence on land cultivated, those households which were poor in 1974–75 were likely to be disadvantaged in some basic sense. They did badly at a time when the environment was generally favorable. This suggests that poverty as measured by income in a good year may be a useful measure for analysis and for policy.

Households of the Jatab caste (a "Scheduled" caste) have been shown in earlier sections to be particularly vulnerable to poverty, which may be the result of a lack of endowments or pervasive discrimination. This vulnerability is supported again here because 13 out of the 17 Jatab households considered poor in 1983-84 according to the apparent prosperity measure were among the poorest 40 percent in income per capita terms in 1974–75. Jatab households have not shown much mobility out of the lowest income groups.

Over the survey years there has been an increase in the number of villagers with nonagricultural employment outside Palanpur. This rise has been most marked between the last two surveys, represents a significant increase in occupational mobility, and has contributed to income mobility for households possessing these jobs. However, with respect to agricultural laborers, an interesting finding is that out of the 31 households involved in agricultural labor in 1983-84 and present in the village in 1957–58, 21 were agricultural labor households in 1957–58. Mobility out of this particular occupation seems to be quite limited and is a constraint on these household's income mobility.

V. Concluding Comments

The analysis of policy toward poverty and the poor involves first asking "Who are the poor?" This requires clear definitions of poverty which can be used in

applied analysis, and an identification of who the poor are under the different definitions. We may then ask how policy can be designed so that the standard of living of the poor is improved, and what are the costs and efficiencies, appropriately defined, of the different possible policies. Indicators that can be used for applied research may not be feasible for policy administration. Our major emphasis in this article has been on the first set of questions, although our answers to them for Palanpur do have implications for the second.

We have concentrated in this article on two indicators of standard of living for the purpose of examining who are the most vulnerable. The first is the apparent prosperity index constructed independently yet with strongly similar results by Jean Drèze and Naresh Sharma. The second is income per capita, both current and "permanent," where the latter refers to a simple average over four survey years. Although it has not been our concern here to explore in detail the precise meaning and content of the standard of living (see, for example, Sen 1987), we have been concerned more or less quantitatively with indicators which go beyond income such as wealth (via land, consumer durables, or productive assets), education, health, and occupation.

The index of "apparent prosperity" was only constructed for 1983–84 because it was based on the extended and close knowledge of Palanpur available for that year. Mobility questions were discussed in terms of the other indicators, notably current income. Interestingly, the poor in 1983–84, as identified by the apparent prosperity index, coincided much more closely with the poor defined in terms of current income in 1974–75 than those defined in terms of current income in 1983–84. This points to two things, namely, the variability of income, and the fact that poverty in terms of current income in a good agricultural year (1974–75) may provide a better indication of sustained poverty than it does in a bad agricultural year (1983–84). It cannot, of course, be asserted that income in a good year is necessarily the appropriate concept for measuring poverty. Generally, the changes in the picture of poverty resulting from the use of different measures (apparent prosperity, current income, and permanent income), together with the volatility of income, confirm the inadequacy of income, in its short-term sense, as a basis for identifying the poor.

Other aspects of the standard of living have an association with apparent prosperity but are far from perfectly correlated with it. The changes in both the inequality of land owned and in landlessness have been particularly associated with the splitting of households in advance of the division of land among sons. Hence, if these sons retain entitlement to the use of their fathers' land, a sharp rise in landlessness should not necessarily be associated with a dramatic increase in poverty, notwithstanding the fact that the landless are more likely to be poor than the landed. Apart from this feature of household splits, the distribution of land changes only very slowly.

Involvement in agricultural labor (around 30 percent of households) is strongly associated with poverty. Conversely, those households with regular outside (nonagricultural) employment are unlikely to be poor. Poor health of

earners also appears to be associated with poverty. Another group with high poverty risk is the Jatab caste, which ranks lowest in the caste hierarchy of Palanpur. Although education in Palanpur is unevenly distributed and illiteracy is common, it is striking that the Jatabs are almost entirely illiterate.

The identification of the poor can provide guidance for the evaluation of policy. For example, the association of poverty with agricultural labor might suggest that the provision of more regular employment at current wage levels could provide a substantial improvement in the position of the poor. Such a policy measure would involve the usual administrative advantages of self-targeting of beneficiaries. The close study of a village can contribute to the assessment of a proposed policy in terms of how it might function in a setting that has been examined carefully and is relatively well understood. That work we hope to develop further. The first stage, and the purpose of this paper, has been to understand the meaning of poverty and to find out who are the poor.

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Measuring Changes in Poverty: A Methodological Case Study of Indonesia during an Adjustment Period

Martin Ravallion and Monika Huppi

Analysis of the effects of policy changes on the poor is often hindered by the difficulties inherent in measuring poverty and comparing levels of poverty before and after policy changes. This article outlines two techniques which can overcome many of these measurement problems: stochastic dominance conditions, which can facilitate a robust poverty ranking of distributions of living standards; and a decomposable poverty index, which allows measured changes in aggregate poverty to be disaggregated into their various components, such as the changes among population subgroups, and growth and redistributive components. These techniques can be applied to a wide range of indicators of economic well-being and poverty lines, and to assumptions about the poor. The approaches are illustrated using household survey data from Indonesia before and after external shocks and the subsequent structural adjustment program in the mid-1980s. The study finds that favorable initial conditions and a pro-poor pattern of growth enabled Indonesia to maintain its momentum in poverty alleviation during the period.

omparisons of the magnitude and severity of poverty can provide direct evi-
ence of an economy's progress in raising living standards of the poor and throw
ght on how the poor are affected by specific macroeconomic changes and
ublic policies. Several difficult methodological issues cloud such comparisons,
owever. The chosen indicator of a household's economic well-being must be
adily quantified, it must reflect the range of factors that contribute to well-
eing, and it must be comparable across sectors, regions, and periods. Having

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chosen an indicator of individual well-being, an equally contentious issue is the selection of a minimal acceptable level of that indicator beyond which a person is not deemed to be poor: the poverty line. Finally, there is the choice of a summary statistic with which to aggregate information on poverty across individuals or households.

Several measures have been proposed. The most commonly used, the head-count index, measures poverty simply as the fraction of the population who are poor. Other indexes account for the severity of poverty, by weighing extremes of poverty more heavily. These measurement issues can make poverty assessment controversial. If, for example, conditions for the poorest have deteriorated without other changes, the head-count measure will not reveal this fact but other measures may. Furthermore, the magnitude of poverty measured by any index will depend on the chosen indicator of well-being and the level of the poverty line. Thus when evaluating how poverty has changed, different methods of measurement may produce different conclusions.

Though many of these issues remain unresolved, substantial progress in the theory of welfare and poverty measurement has been made in recent years. Using data from Indonesia, we will illustrate how some of these advances in methodology can help resolve the empirical uncertainties surrounding poverty comparisons over time.

The proportion of Indonesians who attained minimal nutritional and other consumption needs rose significantly in the 1970s (Rao 1984; CBS [Central Bureau of Statistics] 1984). Several writers have expressed concern, however, that this success in poverty alleviation has not been sustained through the difficult 1980s (see, for example, Jayasuriya and Manning 1988, Sundrum 1988, Booth and Sundrum 1988, and Papanek 1988). The major external shock of the 1980s was the 63 percent fall between 1981 and 1986 in the price of Indonesia's main export and source of public revenue, oil. During 1986 alone, this resulted in a drop of about a third in the country's external terms of trade. The government responded quickly with cuts in real public spending, sweeping tax reforms, and in September of 1986, a 31 percent currency devaluation. It is now widely agreed that these policies were effective in stabilizing the main macroeconomic aggregates. How did the external shocks, and the government's policy response, affect Indonesia's poor in the short term?

The effect on the poor of reduction in government spending will typically depend on the allocation of the cuts across different expenditure categories. Much of the immediate burden of adjustment fell on domestic savings and investment rather than private consumption. Government saving was cut by more than 50 percent and public investment fell by more than 15 percent in 1986 alone, whereas private consumption actually grew modestly over the 1984–87 period. When average household consumption is maintained, poverty will not increase provided that (and it is an important proviso) the poor do not lose from changes in the *distribution* of consumption. It appears that the government did try to prevent its expenditure cuts from falling too heavily on current

xpenditures and investments for programs which disproportionately benefit the oor: transfers to the provinces were maintained, as were labor-intensive rural ıfrastructure projects, and the shares of social services and agriculture in total overnment development expenditures rose (World Bank data; Ahmed and Peers 1990). The efficacy of these measures in protecting the poor is less obvious, owever (Keuning and Thorbecke 1989).

The effects on the poor of the changes in relative prices associated with ructural adjustment are also unclear. Devaluation will increase prices of traded oods and thus draw producers, employment, and income out of nontradables ito the traded goods sector. The currency devaluations and the boom in nonoil xports undoubtedly helped the rural sector: agriculture accounted for more ıan half of the rise in nonoil exports between 1986 and 1987 (Bank of Indoesia 1988). The rural poor would only have gained, however, if they were net roducers of tradable goods. There are likely to be many poor households in oth rural and urban areas which are not. There has also been some indication a decrease in real agricultural wage rates in Java during the 1980s (Papanek 988), though conflicting evidence also exists (Collier and others 1988).

Another issue is whether the poor can buffer their consumption from the verse *income* effects of short-run macroeconomic shocks and policy reonses. It is not implausible that many of the poor do have strategies for coping ith short-run income declines. To the extent that they can increase their hours work, take second jobs, draw on savings, or obtain assistance from a network friends and relatives, the poor may be able to maintain consumption through adjustment period (for evidence on informal social insurance arrangements in va, Indonesia, see Ravallion and Dearden 1988). We do not know the extent which these coping strategies will be effective in a recessionary period, and to ıat extent they will be available to the poorest of the poor.

Thus neither theory nor evidence are conclusive in predicting the effects of the ternal shocks and domestic adjustments on Indonesia's poor. Fortunately we ve access to two large and comparable household surveys for 1984 and 1987, anning the adjustment period. The twin objectives of this article are: (i) to scribe several recent theoretical advances in poverty analysis, and (ii) to illuste their use through an evaluation of the change in poverty and undernutrin in Indonesia over the 1984–87 period. Section I informally discusses the thodological issues related to the measurement of poverty and undernutrin. Section II proposes two simple decomposition formulas which can throw ıt on the contributions of sectoral gains and population shifts (on the one ıd), and economic growth and changes in inequality (on the other) to aggree changes in poverty. Our main empirical results are presented in section III, which we give poverty assessments for various indicators of the standard of ng of the poor. Section IV uses the decomposition formulas given in section II ry to better understand the sources of the measured change in aggregate erty. The importance of the country's favorable distributional parameters at beginning of the period is also discussed. The sensitivity of these results to

measurement errors in rates of rural inflation and growth rates of consumption are assessed in section V. In the light of our findings, section VI discusses Indonesia's prospects for future poverty alleviation, and section VII offers conclusions.

I. Measuring Poverty

Two fundamental questions arise when measuring poverty. The first is how an individual's "standard of living" should be quantified, and relatedly, how a minimum acceptable standard, the poverty line, is to be determined. The second is how the degree of poverty relative to a particular poverty line is measured and how this is aggregated across those who are deemed to be poor. Measurement will always be constrained by data availability. Individuals and their environments will differ in many ways which might be deemed relevant in principle but are not readily quantifiable. Similarly, variability in nutrient requirements between people is important, but difficult to quantify.

We shall discuss some of these problems in section III, but we begin here by assuming that an acceptable indicator is available for an individual's living standard. If the indicator values are arranged in ascending order from poorest to richest, we have a distribution of that indicator within the population. We then face the second problem: how to compare distributions of that indicator which, in the application here, are the observed survey distributions at two dates.

A large theoretical literature has established several desirable properties for poverty measures (for an excellent survey, see Foster 1984). The measure of poverty should increase when the income of a poor household decreases (the monotonicity axiom) or when income is transferred from a poor to a less poor household (the transfer axiom). These criteria imply that one wishes the measure to take account of the distribution of living standards among the poor, not simply to indicate how many people are poor. It is also desirable that the poverty measure be additively decomposable by population subgroup so that aggregate poverty can be represented as an appropriately weighted sum of poverty levels in the component subgroups of a population. This property facilitates the construction of poverty profiles—showing how poverty varies across subgroups of a population—and it also ensures that when poverty increases in one subgroup without any other changes, aggregate poverty will also increase.

A class of additively decomposable measures is that proposed by Foster, Greer, and Thorbecke (1984; hereafter FGT), and it is this which we will employ here. The FGT class contains a number of other commonly used poverty measures as special cases. The most commonly used poverty measure has been the head-count index, which gives the proportion of the population with a standard of living below the poverty line. But it does not indicate *how* poor the poor are; it is unchanged if a poor individual becomes poorer. One index that does reflect changes in the degree of poverty among the poor is the poverty gap index. This is the average, over all households, of the gaps between poor households' stan-

lards of living and the poverty line, as a ratio of the poverty line. This gives a good indication of the *depth* of poverty. But the poverty gap index is not sensitive to the distribution of the standard of living indicator among the poor, and so t does not capture the *severity* of poverty. The FGT class of measures subsumes these two measures, *and* provides a distributionally sensitive measure, through the choice of a parameter, α: the larger is α, the greater the weight given by the ndex to the severity of poverty.

The FGT class of measures treats poverty as dependent on the poverty gap ratio, the parameter α entering as a power of that ratio. Let y_j denote consumption per capita for the jth person's household when households are ranked in ascending order of consumption (taking consumption per capita as the indicator). The poverty line is z and the poverty gap for individual j is $g_j = z - y_j$. Total population size is denoted as n, and q is the number of poor people. The GT class of measures may then be written as:

$$P_\alpha = \frac{1}{n}\sum_{j=1}^{q}\left(\frac{g_j}{z}\right)^{\alpha} \qquad (1)$$

where g_j/z is the poverty gap ratio. Three members of the FGT class are considered here:

- The FGT poverty measure for $\alpha = 0$. This is simply the head-count index, given by the proportion of the population with a standard of living below the poverty line: $P_0 = q/n$. For example, if 40 percent of the population are deemed to be poor, then $P_0 = 0.4$.
- The measure for $\alpha = 1$. This is the average poverty gap in the population, expressed as a proportion of the poverty line:

$$P_1 = \frac{1}{n}\sum_{j=1}^{q}\frac{g_j}{z}$$

Thus a value of $P_1 = 0.1$ means that the aggregate deficit of the poor relative to the poverty line, when averaged over all households (whether poor or not), represents 10 percent of the poverty line. (P_1/P_0 is the mean poverty gap of the poor as a proportion of the poverty line:

$$\frac{P_1}{P_0} = \frac{1}{q}\sum_{j=1}^{q}\frac{g_j}{z}\ .$$

The measure for $\alpha = 2$. Unlike the other two, this measure is sensitive to the distribution of income among the poor. It satisfies the main axioms for a desirable poverty measure in the literature, including Sen's (1976) "transfer axiom," which requires that when a transfer is made from a poor person to someone who is poorer, the measure indicates a decrease in aggregate poverty. Its desirable properties make it our preferred measure.

We can now demonstrate the decomposable property of P_α. We consider th population split into m subgroups with populations n_i ($i = 1, \ldots, m$; notic that

$$n = \sum_{i=1}^{m} n_i).$$

The FGT class of measures can then be written as:

$$(2) \qquad P_\alpha = \sum_{i=1}^{m} \frac{P_{\alpha i} n_i}{n}$$

which is simply the population-weighted mean of the subgroup poverty index $P_{\alpha i}$. The index $P_{\alpha i}$ gives, for each subgroup i containing n_i persons, the measur described in equation 1:

$$(3) \qquad P_{\alpha i} = \frac{1}{n_i} \sum_{j=1}^{q_i} \left(\frac{g_{ij}}{z}\right)^\alpha$$

where $g_{ij} = z - y_{ij}$, the poverty gap for the jth household in subgroup i. Thus by an appropriate choice of α, the measures continue to satisfy the desired axioms when aggregate poverty is decomposed by subgroups. We will exploit this property throughout the analysis.

Although major advances have been made in the search for better *cardinal* measures of poverty and undernutrition, there is still widespread concern over arbitrariness in the choice of a poverty line, or nutrition cutoff point, and in the choice of a specific functional form for the poverty measure. For example, the popular FGT measure P_2 uses only one of a number of possible functional forms, all satisfying the main axioms for a desirable poverty measure (Atkinson 198 surveys other examples).

Fortunately, for many (though not all) applications, all that one is really concerned about is the *ordinal* ranking of distributions. For example, the main question of interest may be: did poverty increase as a result of, say, structural adjustment? As a rule, the answer to this question requires only that we know the direction of poverty change (the ordinal comparison), not how *much* poverty has changed (the cardinal comparison).

When ordinal comparisons suffice, we need not confine ourselves to a particular poverty line and poverty measure but can draw on recent results on the use of dominance conditions in ordering indicator distributions using a variety of lines and measures (important contributions are Atkinson 1987 and Foster and Shorrocks 1988). If the class of poverty measures satisfies certain rather mild conditions (notably that the measures are continuous, separable, symmetric and weakly monotonic), we can apply the first-order dominance test. Suppose that the cumulative proportion of the population below each value of the standard of living indicator is graphed on the vertical axis and the indicator value on the horizontal axis. If the curve of one distribution, A, lies entirely below the

of another, B, then A first order dominates B. Regardless of the poverty line or poverty measure, we then know that poverty is lower for A than B. First-order dominance over the whole range of incomes also implies an unambiguous ranking in terms of the head-count index when the poverty line varies across the population in some unknown way, such as would arise because of errors in measuring individual living standards, or because of unknown differences in nutrient requirements. Nonintersecting distribution functions can thus be a powerful test for establishing poverty rankings.

If the distribution functions intersect at one or more points, then we know that different poverty lines or poverty measures will rank the distributions differently; some will indicate a decrease in poverty and others will not. We need more information. Here the stronger second-order dominance test can be useful. The test says that if the area under one distribution function, A, is less than that under another, B, over the entire range of admissible poverty lines, then A exhibits less poverty than does B for all distributionally sensitive measures, such as all FGT measures for which $\alpha > 1$. Thus, by adding this mild restriction to the set of admissible poverty measures, we may be able to achieve an unambiguous ranking of distributions, despite the fact that first-order dominance does not hold.

II. Decomposing Measured Changes in Aggregate Poverty

Given measurements of poverty at two dates, it may also be of interest to explore the factors underlying the observed changes. For this purpose, we have devised two simple formulas which allow one to decompose a measured change in aggregate poverty into its constituent parts. These indicate how the aggregate change reflects intrasectoral gains versus intersectoral shifts in population, and changes in average income as compared with changes in the distribution of income.

The first formula aims to assess the relative gains to the poor within specific *sectors* and the contribution of changes in the distribution of the population across those sectors. Suppose that we have P_α poverty measures for each of two dates, t (t = 1984 and 1987), and two sectors, i ($i = u$ and r for urban and rural). The change in aggregate poverty between the two dates can be decomposed into intrasectoral effects, population shifts, and interaction effects, as follows:

(1)
$$P_\alpha^{87} - P_\alpha^{84} = \underbrace{(P_{\alpha u}^{87} - P_{\alpha u}^{84})n_u^{84}}_{\text{Change in urban poverty at the 1984 population share}} + \underbrace{(P_{\alpha r}^{87} - P_{\alpha r}^{84})n_r^{84}}_{\text{Change in rural poverty at the 1984 population share}}$$

Intrasectoral effects:

$$+ \underbrace{\sum_{i=u}^{r} (n_i^{87} - n_i^{84})P_{\alpha i}^{84}}_{\text{Change in poverty arising from population shifts}} + \underbrace{\sum_{i=u}^{r} (P_{\alpha i}^{87} - P_{\alpha i}^{84})(n_i^{87} - n_i^{84})}_{\text{Interaction between sectoral changes and population shifts}}$$

where $P^t_{\alpha i}$ denotes measured poverty in sector i at date t with corresponding population share n^t_i. Intuitively, the intrasectoral effects are the contribution of gains to the poor within each sector to the change in aggregate poverty. The population shift effect shows how changes in the distribution of the population across sectors contributed to the change in aggregate poverty. The interaction effect can be interpreted as a measure of the correlation between population shifts and intrasectoral changes in poverty. We shall call equation 4 the sectoral decomposition of a change in poverty.

The second formula decomposes the change in poverty into a change in the mean consumption level of a given distribution, and a change in the distribution of consumption around the mean. The qualitative effect on measured poverty of a reduction in inequality at a given mean is not obvious a priori. For example, although a transfer of income from someone at the poverty line (or only slightly above it) to someone well below it will reduce inequality, it will also increase the head-count index of poverty. The usual measures of inequality, such as the Gini coefficient, can be a poor indicator of how changes in distribution have affected aggregate poverty (Datt and Ravallion 1990). We need other tools of analysis to decompose changes in poverty measures into growth and distributional effects.

To derive the second decomposition formula, let P^{87*}_α denote the measure of poverty in 1987 if only mean consumption changed since 1984 without any change in relative consumption levels; that is, P^{87*}_α is obtained by applying the 1987 mean to the 1984 Lorenz curve. Similarly, let P^{87**}_α denote the poverty level in 1987 if only the Lorenz curve had shifted since 1984, leaving the mean unchanged. The observed change in poverty between two dates can then be decomposed into growth and distributional effects as follows:

$$(5) \qquad P^{87}_\alpha - P^{84}_\alpha = \underset{\substack{\text{Growth effect:}\\ \text{change in poverty given}\\ \text{change in mean con-}\\ \text{sumption holding 1984}\\ \text{Lorenz curve constant}}}{(P^{87*}_\alpha - P^{84}_\alpha)} + \underset{\substack{\text{Distributional effect:}\\ \text{change in poverty given}\\ \text{shift in the Lorenz curve}\\ \text{holding 1984 mean}\\ \text{consumption constant}}}{(P^{87**}_\alpha - P^{84}_\alpha)} + \underset{\substack{\text{Interaction between}\\ \text{effects of growth}\\ \text{and changes in}\\ \text{distribution}}}{\text{residual}}$$

We shall call this the growth-equity decomposition of a change in poverty. The two simulated poverty measures, P^{87*}_α and P^{87**}_α, are calculated by econometrically estimating parametric specifications of the Lorenz curves and deriving the poverty measures as functions of those parameters and of the mean income and the poverty line. (Datt and Ravallion 1990 outline the methodology in greater detail.) Note that this decomposition is not exact; the residual is the difference between the distributionally neutral growth effect given the 1987 Lorenz curve and that evaluated at the 1984 Lorenz curve. The residual will only vanish if the distributionally neutral growth effect on poverty is independent of the Lorenz curve (or, equivalently, if the distributional effect is independent of the mean). That does not hold for the poverty measures and Lorenz curve parameter estimates considered in this study, nor does it appear likely to ever hold for any plausible Lorenz curve (Datt and Ravallion 1990).

One should be cautious in drawing policy implications from the growth-equity decomposition. Distributionally neutral growth is not the same thing as growth with *distributionally neutral policies*. The laissez-faire growth path of an economy need not be distributionally neutral, and policy interventions aimed at reducing relevant inequalities may well be essential to attaining even distributionally neutral growth. The growth-equity decomposition is a simple descriptive device intended to throw light on the proximate causes of poverty alleviation; a deeper analysis of those causes would be needed to draw sound policy implications.

III. The Data and Results

Following past practice for Indonesia, we shall base our poverty assessments mainly on distributions of household consumption per person. We draw on Indonesia's National Socioeconomic Surveys (SUSENAS) data on consumption from both market expenditures and own production for 50,000 randomly sampled households comprising 250,000 persons at each date. The data are available on magnetic tapes supplied by the Central Bureau of Statistics, Indonesia. We adjusted the data to February 1984 urban prices using a modified version of Indonesia's consumer price index (CPI). The ordinary CPI is far from ideal for our purposes because it is constructed only for urban areas and its goods composition is inappropriate for the poor. We have reweighted the CPI so as to better reflect the consumption pattern of the poor. Price deflation was done at the province level before aggregation. The SUSENAS survey almost certainly underreports consumption, but because such underreporting is likely to be more serious at high incomes, the poverty assessments are still likely to be reasonably accurate.

For the purpose of assessing poverty during macroeconomic adjustment, there are two problems with these data. The first and most worrying is that the SUSENAS surveys imply a higher growth rate of real private consumption per capita over 1984–87 than that implied by the national accounts. We shall return to this point in section V. Second, the methodology we use may be quite insensitive to changes in the supply of publicly provided goods, because such changes are unlikely to be properly reflected in household consumption expenditures.

We have assumed a rural poverty line of Rp10,000 per month (in 1984 prices), equivalent to about $31 per month, at 1985 purchasing power parity (Summers and Heston 1988). This closely approximates the poverty line used in past World Bank studies, after adjusting for inflation (Rao 1984, 1986). We have assumed that urban prices were 10 percent higher than rural prices; this is consistent with Rao (1984, 1986) and with estimates of cost-of-living differentials in Java by Ravallion and Van De Walle (forthcoming, b). The urban poverty line is thus Rp11,000. All further consumption and income variables will be expressed in 1984 urban prices, assuming this 10 percent cost-of-living differential.

We shall also present estimates of urban poverty on the basis of an alternative urban poverty line set 50 percent higher than the rural poverty line. Although this is far more than cost-of-living differences would appear to warrant, it may be defended by "relative poverty considerations"—the assumption that the urban lifestyle may require a more diversified consumption pattern. A 50 percent differential in urban-rural poverty lines is consistent with the practice of some past research on poverty in Indonesia (CBS 1984; Sayogyo and Wiradi 1985).

Table 1 gives our cardinal estimates of poverty in Indonesia for various poverty measures and for both urban poverty lines. All three measures, including the preferred "distributionally sensitive" measure, and both urban poverty lines indicate a significant decrease in poverty over the 1984–87 period.

We find that the head-count index of poverty decreased from approximately 33 percent at the beginning of the period to slightly more than 20 percent by 1987; this is a substantial contraction over just three years. The poverty gap measure implies that the aggregate consumption shortfall of the poor declined from about Rp937 per month per head of Indonesia's population (representing about 5.5 percent of national mean consumption) to Rp464 in 1987 (about 2.3 percent of the national mean).

Are the qualitative results robust to the choice of poverty line and measure? Figure 1 gives the cumulative frequency distributions of consumption in 1984 urban prices for 1984 and 1987. The 1984 distribution lies entirely above the 1987 distribution. Thus the first-order dominance condition holds, and so one can conclude that all well-behaved poverty measures and all possible poverty lines will show an unambiguous decrease in aggregate poverty between the two dates. This was found to hold for both urban and rural areas.

From figure 1 we can also assess the sensitivity of this conclusion to possible underestimation of price increases facing the poor. The 1987 poverty line (in 1984 urban prices), which would be needed for the 1987 national head-count index of poverty to equal that of 1984 (Rp11,000), is Rp12,818. Thus an additional inflation rate over three years of at least 16.5 percentage points (on top of the CPI-based estimate of about 20 percent) would have been needed to reverse the conclusion that poverty has decreased by this measure. Similarly, the true annual inflation rate would need to be about 4.5 points higher (or 14.1 points higher over the three years) to equalize the head-count indexes for the two dates at the higher poverty line. Thus the conclusion that poverty has decreased would be robust to even quite substantial measurement error in the CPI; the inflation rate would need to have been underestimated by at least 50 percent to reverse our conclusion.

A potentially important observation about the results in figure 1 is that the poverty lines are found on a steep segment of the consumption distribution. This is illustrated more clearly by the density function of consumption shown in figure 2, which, for any given level of consumption, shows the slope of the cumulative distribution function at that level. The poverty line is very close to the mode, where the slope of the distribution function reaches its maximum.

ıle 1. *Aggregate Poverty Measures, Indonesia, 1984 and 1987*

:rty measure (P_α) and sector	*Poverty, 1984*	*Poverty, 1987*	*t-statistic for 1984–87 difference*[a]	*Decline, 1984–87 (percent)*
d-count index (α = 0) (percent)				
an 10 percent[b]	12.08	7.32	14.35	39.40
	(0.26)	(0.21)		
an 50 percent[c]	28.04	21.17	14.21	24.50
	(0.36)	(0.33)		
al	39.43	26.80	35.77	32.03
	(0.26)	(0.23)		
ıl[d]	33.02	21.65	40.86	34.39
	(0.21)	(0.18)		
:rty gap index (α = 1) (percent)				
an 10 percent[b]	2.68	1.25	17.70	53.36
	(0.07)	(0.05)		
an 50 percent[c]	7.31	4.67	14.21	36.11
	(0.12)	(0.09)		
al	10.32	5.29	46.37	48.74
	(0.09)	(0.06)		
ıl[d]	8.52	4.22	51.63	50.47
	(0.07)	(0.05)		
ributionally sensitive index (α = 2)[e]				
an 10 percent[b]	0.92	0.33	15.61	64.13
	(0.03)	(0.02)		
an 50 percent[c]	2.78	1.50	17.84	46.04
	(0.06)	(0.04)		
al	3.86	1.57	44.50	59.33
	(0.05)	(0.02)		
l[d]	3.17	1.24	49.38	60.88
	(0.03)	(0.02)		

ɔte: The poverty index for the total population is $P_\alpha = \sum_{i=1}^{m} P_{\alpha i} \frac{n_i}{n}$; and for each sector i as

$= \frac{1}{n} \sum_{j=1}^{q_i} \left(\frac{g_{ij}}{z}\right)^\alpha$ T, where n_i = the population of sector i, q_i = the number of poor individuals in ır i; z = the poverty line; $g_{ij} = z - y_{ij}$, the poverty gap, where y_{ij} is the consumption per capita of the ousehold in sector i. A higher α indicates that the measure is more sensitive to lower consumption ng the poor. See equations 2 and 3 in the text. Numbers in parentheses are standard errors (s.e.).

$t = (P_\alpha^{87} - P_\alpha^{84})$/standard error of $(P_\alpha^{87} - P_\alpha^{84})$. All differences are statistically significant at the 1 :nt level.

Assumes that the cost of living, and hence the poverty line, in urban areas is 10 percent higher than ral areas.

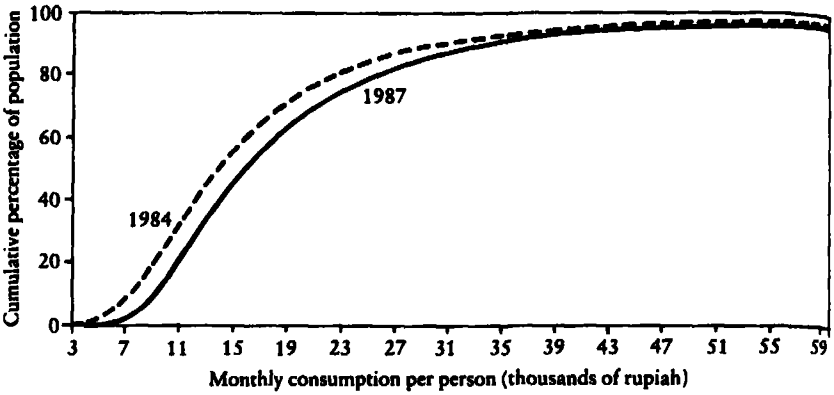
Assumes that the poverty line in urban areas is 50 percent higher than in rural areas.

Using the 10 percent higher poverty line for urban areas.

The calculated values of P_2 have been multiplied by 100.

urce: Authors' calculations based on data tapes from the National Socioeconomic Surveys, Central au of Statistics, government of Indonesia. Calculations for the t-statistics are based on Kakwani's 0a) standard errors.

Figure 1. *Distribution of Consumption, Indonesia, 1984 and 1987*



Note: Each point on the curve shows the percentage of people living in households consuming less than the amount on the horizontal axis. Consumption is given in 1984 urban prices.

Source: Authors' calculations based on data from the National Socioeconomic Surveys, Central Bureau of Statistics, government of Indonesia.

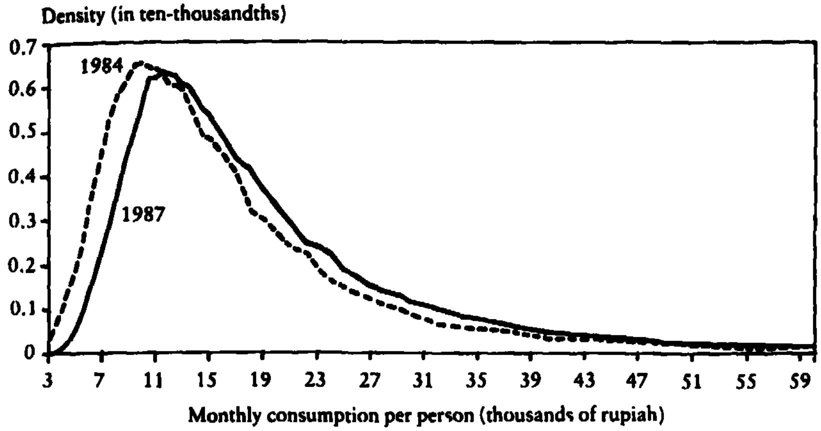
This has two implications of interest here. First, estimates of the head-count index of poverty will be particularly sensitive to the exact location of the poverty line, as our comparison of the urban poverty lines at 10 and 50 percent cost-of-living differentials in table 1 has suggested. Second, measured levels of poverty will be very responsive to horizontal shifts in the distribution of consumption. If the poverty line is at the mode of per capita consumption, the response of the head-count index to an additive gain or loss at all consumption levels will be at its maximum. As the results of the following section will demonstrate, the response of poverty in Indonesia to shifts in consumption in the form of distributionally neutral changes in the mean was also high in the mid-1980s. This is a factor in understanding how recent economic growth has affected poverty.

Is our qualitative result on the change in poverty over this period robust to the choice of an indicator of the standard of living? Three alternative standards will be considered: income, food expenditure share, and caloric intake.

Figure 3 gives the distributions of household income per person, again in 1984 urban prices. A comparison of the entire frequency distribution again reveals that the first-order dominance condition holds. No matter where one draws the poverty line, or what poverty measure one uses (within a broad class), aggregate poverty (measured in terms of income) unambiguously fell between 1984 and 1987. This conclusion is also robust to substantial measurement error in the CPI.

In view of the problems of comparing surveyed consumption and income *levels* over time, we consider the share of total household consumption expendi-

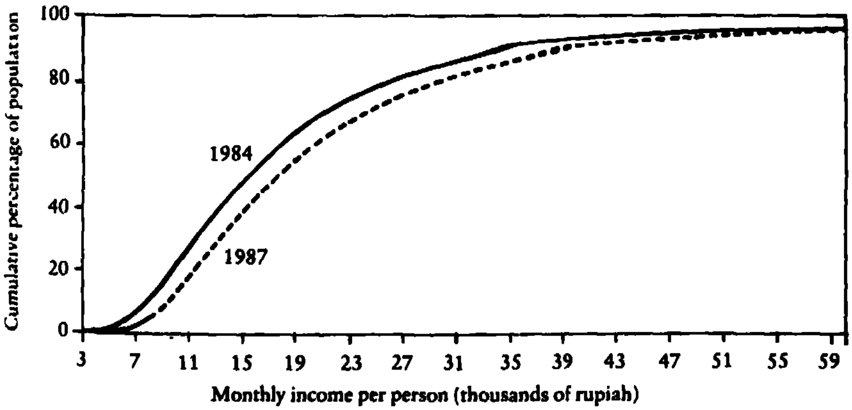
Figure 2. *Densities of Consumption, Indonesia, 1984 and 1987*



Note: The curve shows the slope of the corresponding distribution function in figure 1 at each consumption level.

Source: Authors' calculations based on data from the National Socioeconomic Surveys, Central Bureau of Statistics, government of Indonesia.

Figure 3. *Distribution of Income, Indonesia, 1984 and 1987*



Note. Each point on the curve shows the percentage of people with household income per person less than the amount on the horizontal axis. Income is given in 1984 urban prices.

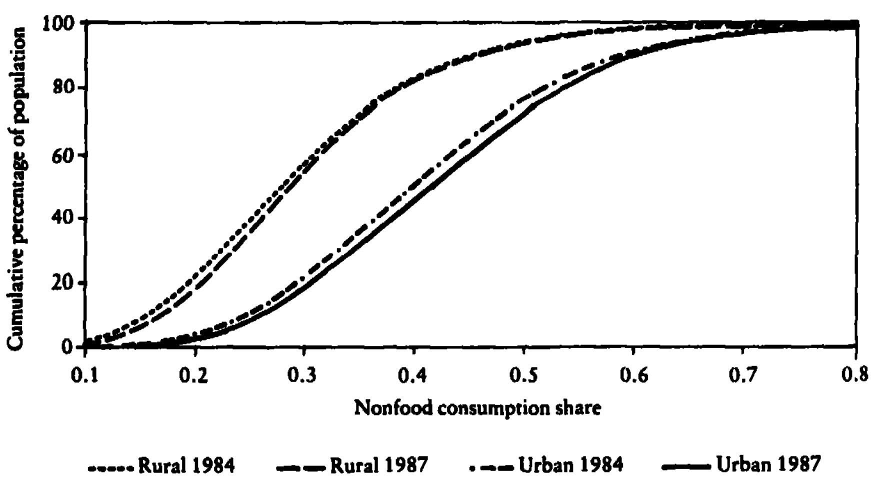
Source: Authors' calculations based on data from the National Socioeconomic Surveys, Central Bureau of Statistics, government of Indonesia.

tures devoted to nonfood goods. This is generally found to be a monotonically increasing function of real consumption and is thus a good indicator of real consumption levels. That function will only be the same, however, for households which are homogeneous in relevant respects—the real consumption level corresponding to a given food share will generally vary according to relative prices, demographic factors, and tastes. Differences in relative prices and (possibly) tastes between urban and rural areas could well be the most important factor influencing measured differences in food shares across households in Indonesia. For this reason we will consider urban and rural areas separately.

Figure 4 gives the cumulative frequency distributions of the share of nonfood goods in total consumption for urban and rural areas in 1984 and 1987. First-order dominance still holds up to high levels of nonfood shares, so a wide range of poverty lines and measures will continue to indicate a decrease in poverty in both sectors over this period. The proportion of the rural population with a food share in excess of 75 percent fell from 39.2 percent in 1984 to 35.8 percent in 1987, whereas for the urban sector it fell from 10.5 to 8.5 percent. The decline in poverty is not nearly as dramatic as that suggested by the CPI adjusted consumption and income data, but it is still evident in the decline in food shares.

Did undernutrition also diminish? The SUSENAS tapes provide estimates of household calorie intakes, obtained by applying caloric unit values to the quantities consumed of 170 foods and beverages. The survey probably underestimates calorie intakes, because it does not survey the quantities of foods eaten

Figure 4. *Share of Nonfood Consumption in Total Consumption Expenditure for Rural and Urban Households, Indonesia, 1984 and 1987*



Note: Each point on the curve shows the percentage of people with a nonfood consumption share less than the amount on the horizontal axis.

Source: Authors' calculations based on data from the National Socioeconomic Surveys, Central Bureau of Statistics, government of Indonesia.

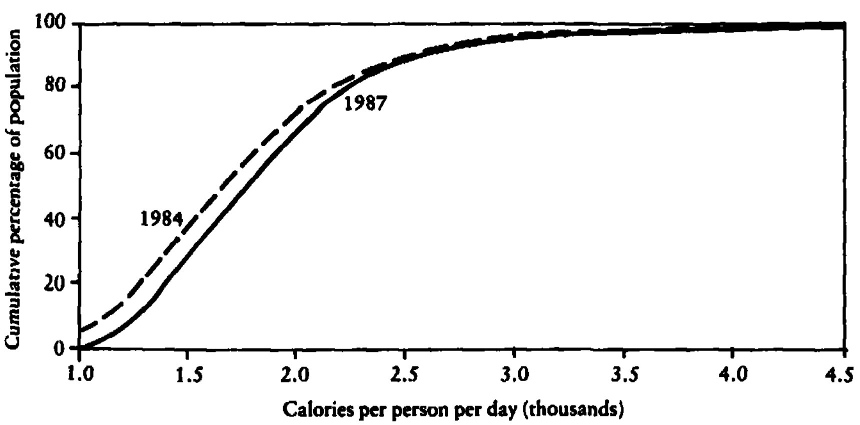
away from home (Van De Walle 1988). This need not invalidate use of the SUSENAS for comparing calorie intake distributions over time. For example, if a constant proportion of calorie intake is obtained away from home, then first-order dominance of one distribution of measured intakes over another would also imply dominance for the (unobserved) true distributions. Furthermore, because real food expenditures at all levels rose over this period, it seems likely that calorie intakes from food eaten away from home would also have increased for the undernourished (Ravallion 1990). An improvement in the distribution of calorie intakes in the SUSENAS data would then imply an improvement in the underlying true distribution.

The distribution of measured caloric intake per person for 1987 lies below that for 1984 up to a high intake level (see figure 5). Only among the upper 9 percent of the population was intake higher in 1984. First-order dominance thus holds up to high caloric norms. The second-order dominance condition discussed in section I holds over the entire distribution. Thus a broad class of undernutrition measures would show an improvement whatever the underlying distribution of caloric requirements. These results also hold in both urban and rural areas.

IV. Decompositions of Indonesia's Progress in Alleviating Poverty

We now examine some of the factors which contributed to the measured decline in poverty. The relative sectoral shares in poverty and the relative

Figure 5. *Distribution of Caloric Intake, Indonesia, 1984 and 1987*



Note: Each point on the curve shows the percentage of people living in households with calorie intakes per person less than the amount on the horizontal axis (excluding foods not prepared at home).

Source: Authors' calculations based on data from the National Socioeconomic Surveys, Central Bureau of Statistics, government of Indonesia.

changes in the mean and distribution of consumption expenditure are analyzed using the decomposition formulas developed in section II. We also consider the influence of initial poverty conditions on the potential for alleviation.

The results of section III indicate significant poverty alleviation between 1984 and 1987 in both urban and rural sectors. There was also a shift in population over the period, with a declining share of the population residing in the poorer rural sector (down from 76.5 percent in 1984 to 73.6 percent in 1987). What was the relative contribution of these factors to the reduction in poverty?

Table 2 gives the urban-rural sectoral decomposition of the change in aggregate poverty derived from equation 4. For all measures, both population shifts and gains to the urban and rural sectors alleviated aggregate poverty, and these improvements were dampened only slightly by the negative interaction effect. The gains to the rural sector accounted for the vast majority of aggregate poverty alleviation. For the P_2 poverty measure, which attaches greater weight to the poverty gap of the poorest of the poor, the gains to the rural sector represented more than 90 percent of the aggregate gain.

In light of this result we investigated further the distribution of gains within that sector. For this purpose, all households were classified by their principal source of income among twenty-one distinct sources for each sector. The poorest rural groups—farm laborers and self-employed farm households—which accounted for only 11 and 57 percent of all rural persons, respectively, accounted for 17 and 61 percent of the aggregate drop in poverty according to the P_2 measure (Huppi and Ravallion 1990).

Turning to the growth-equity decomposition (equation 5), we find that the

Table 2. *Decomposition of Change in Poverty into Intrasectoral Effects, Intersectoral Population Shifts, and Their Interaction between 1984 and 1987, Indonesia*
(percentage of total poverty reduction)

	Components of Poverty Alleviation			
	Intrasectoral Effects		*Intersectoral*	*Interaction*
Poverty measure	*Urban*[a]	*Rural*	*population shifts*	*effect*
Head-count index ($\alpha = 0$)	9.83	84.99	7.05	−2.02
Poverty gap index ($\alpha = 1$)	7.81	89.50	5.21	−2.45
Distributionally sensitive index ($\alpha = 2$)	7.18	90.78	4.46	−2.58

Note: The poverty meaures are calculated for the total population as $P_\alpha = \sum_{i=1}^{m} P_{\alpha i}\frac{n_i}{n}$ $i = u, r$; and for each sector i as $P_{\alpha i} = \frac{1}{n}\sum_{j=1}^{q_i}\left(\frac{g_{ij}}{z}\right)^{\alpha}$, where n_i = the population of sector i, q_i = the number of poor individuals in sector i; z = the poverty line; $g_{ij} = z - y_{ij}$, the poverty gap, where y_{ij} is the consumption per capita of the jth household in sector i. A higher α indicates that the measure is more sensitive to lower consumption among the poor.

a. The urban population as a share of the total was 0.235 in 1984 and 0.264 in 1987 (see equation 4 in the text).

Source: Authors' calculations based on data tapes from the National Socioeconomic Surveys, Central Bureau of Statistics, government of Indonesia.

period 1984–87 saw a simultaneous increase in mean consumption and a reduction in the overall inequality of consumption, in both urban and rural sectors. The three-year growth rate in urban consumption implied by the SUSENAS data was 12.1 percent, whereas the rural rate was 14.6 percent. Table 3 gives cumulative shares of consumption by decile for each year. The 1987 Lorenz curves unambiguously dominate those for 1984 in both sectors and nationally. Thus all well-behaved inequality measures will indicate a reduction in inequality over the period. The aggregate Gini index dropped from 0.331 in 1984 to 0.321 in 1987.

Table 4 gives our estimates of the relative contributions of growth and greater equity to poverty alleviation using the decomposition formula in equation 5.[1] In all cases considered in table 4, most of the reduction in poverty can be attributed to higher mean consumption at a given distribution of consumption. The contribution of greater equity (the upward shifts in the Lorenz curve) increases with α, the value of which rises with the weight given to the poorest of the poor.

Because increases in mean consumption are so important in poverty alleviation, the point elasticity of poverty with respect to distributionally neutral growth is also of interest. For the head-count index, this elasticity is simply the elasticity of the cumulative distribution function when evaluated at the poverty line. Following Kanbur (1987) and Kakwani (1990a), we can derive the elasticity with respect to the mean of the entire P_α class of poverty measures; that elasticity is given by:

(6)
$$\begin{aligned} \eta_\alpha &= \frac{-zf(z)}{P_0} < 0 \;(\text{for } \alpha = 0) \\ &= \alpha\left(1 - \frac{P_{\alpha-1}}{P_\alpha}\right) < 0 \;(\text{for } \alpha \geq 1) \end{aligned}$$

where $f(z)$ denotes the probability density of consumption at the poverty line z. This also has to be estimated; nonparametric methods were used, details of which are given in Ravallion and Huppi (1989).

All poverty measures are found to respond elastically to higher mean consumption, holding the Lorenz curve constant (table 4). For a given poverty line and sector, the growth elasticity is highest for the distributionally sensitive measure of poverty and lowest for the head-count index.

The growth elasticity of poverty is a function of the parameters of the underlying consumption distribution. Consider first mean consumption. By differentiating equation 6 with respect to the mean μ, we obtain:

(7)
$$\begin{aligned} \frac{\partial \eta_\alpha}{\partial \mu} &= -\frac{\eta_0^2}{\mu} < 0 \quad (\text{for } \alpha = 0) \\ &= \frac{(\eta_\alpha - \eta_{\alpha-1})\alpha P_{\alpha-1}}{\mu P_\alpha} \quad (\text{for } \alpha \geq 1) \end{aligned}$$

1. Three Lorenz curve specifications were tested (Kakwani-Podder, Kakwani, and elliptical). The Kakwani model gave the best fit in the lower half of the distribution and so was preferred (see Ravallion and Huppi 1989).

Table 3. *Distribution of Household Consumption Expenditure: Lorenz Curve Values, Indonesia, 1984 and 1987*
(cumulative percentage shares)

	Urban		*Rural*		*Total*	
Population decile	*1984*	*1987*	*1984*	*1987*	*1984*	*1987*
10	3.23	3.46	3.77	4.26	3.40	3.78
20	7.88	8.15	8.99	9.81	8.14	8.77
30	13.54	13.84	15.18	16.21	13.82	14.59
40	20.15	20.54	22.25	23.42	20.42	21.20
50	27.76	28.05	30.28	31.46	27.97	28.73
60	36.46	36.74	39.35	40.44	36.62	37.27
70	46.51	46.81	49.65	50.59	46.57	47.10
80	58.38	58.69	61.50	62.25	58.40	58.76
90	73.47	73.58	76.06	76.42	73.31	73.48
Gini index	0.333	0.329	0.293	0.277	0.331	0.321

Source: Authors' calculations based on data tapes from the National Socioeconomic Surveys, Central Bureau of Statistics, government of Indonesia.

Table 4. *Decomposition of Changes in Poverty Measures into Consumption Growth and Redistribution Effects, Indonesia, 1984–87*
(percentage of total poverty reduction)

Poverty measure and sector	*Higher mean consumption*[a]	*Change in distribution*[b]	*Residual*	*1984 consumption point elasticity of* P_α[c]
Head-count index ($\alpha = 0$)				
Urban	78.25	18.29	3.46	−3.27
Rural	82.97	7.72	9.31	−2.00
Total	86.12	6.43	7.44	−2.05
Poverty gap index ($\alpha = 1$)				
Urban	65.81	38.43	−4.24	−3.51
Rural	69.82	30.23	−0.05	−2.82
Total	72.82	26.93	0.25	−2.88
Distributionally sensitive index ($\alpha = 2$)				
Urban	56.07	53.63	−9.71	−3.83
Rural	64.11	43.14	−7.25	−3.35
Total	66.81	39.93	−6.74	−3.38

Note: The poverty measures are calculated for the total population as $P_\alpha = \sum_{i=1}^{m} P_{\alpha i} \frac{n_i}{n}$ $i = u, r$; and for each sector i as $P_{\alpha i} = \frac{1}{n_i} \sum_{j=1}^{q_i} \left(\frac{g_{ij}}{z}\right)^\alpha$, where n_i = the population share of sector i; q_i = the number of poor individuals in sector i; z = the poverty line; $g_{ij} = z - y_{ij}$, the poverty gap, where y_{ij} is the consumption per capita of the jth household in sector i. A higher α indicates that the measure is more sensitive to lower income among the poor.

a. $(P_\alpha^{87*} - P_\alpha^{84})/(P_\alpha^{87} - P_\alpha^{84})$.

b. $(P_\alpha^{87**} - P_\alpha^{84})/(P_\alpha^{87} - P_\alpha^{84})$.

c. $\eta_\alpha = -zf(z)/P_0 < 0$ (for $\alpha = 0$), or, for $\alpha \geq 1$, $\eta_\alpha = \alpha(1 - P_{\alpha-1}/P_\alpha) < 0$.

Source: Authors' calculations based on data tapes from the National Socioeconomic Surveys, Central Bureau of Statistics, government of Indonesia; estimates of Lorenz curves and consumption density from Ravallion and Huppi (1989).

The last derivative is not necessarily negative for all $\alpha \geq 1$, though it is found to be so for $\alpha = 1, 2$ (table 4). This result can be interpreted as an acceleration effect of growth on poverty; a higher level of mean consumption implies a more elastic response of poverty (in absolute value) to further growth. And, conversely, at low average consumption, higher growth rates will be needed to achieve the same proportionate poverty alleviation impact.

Under plausible assumptions about how distribution has shifted over time, it can also be shown, for these data, that the (absolute) elasticity of the FGT class of poverty measures with respect to the mean (again holding the Lorenz curve constant) is a monotonically *decreasing* function of the initial Gini measure of inequality.[2] Differentiating equation 6 with respect to the Gini coefficient, G, it can be shown, analogously to equation 7 that:

$$\frac{\partial \eta_\alpha}{\partial G} = -\frac{\eta_0 \epsilon_0}{G} > 0 \quad (\text{for } \alpha = 0)$$

$$= \frac{(\epsilon_\alpha - \epsilon_{\alpha-1})\alpha P_{\alpha-1}}{G P_\alpha} > 0 \quad (\text{for } \alpha \geq 1)$$

where ϵ_α *denotes the elasticity of the* P_α *poverty measure to the Gini coefficient.*

Indonesia had experienced sustained growth and reductions in overall inequality for many years before the adjustment period. Our results suggest that both growth in mean consumption and the reduction in inequality *before* the adjustment period would have increased the elasticity of aggregate poverty to further growth. It can thus be argued that a history of fairly equitable growth allowed the pace of poverty alleviation to be maintained with lower growth rates during the adjustment period.

V. Alternative Assessments

If growth rates in mean real consumption have been overestimated, the methods we have used so far will have overestimated poverty alleviation in Indonesia. Here we consider two alternative assumptions.

The first assumes a rural rate of inflation above the CPI (which is constructed for urban areas). We know from the dominance analysis in section III that the conclusion that poverty declined would be robust to substantial measurement error in the price deflator. But it may be illuminating to examine the quantitative effect on the estimated measure of poverty of assuming a rural inflation rate of, say, 5 percentage points (over three years) above the CPI (table 5). Under this

2. This assumes that the Lorenz curve shifts such that $L^{87}(p) - L^{84}(p)$ is directly proportional to $p - L^{84}(p)$, where $L^t(p)$ denotes the Lorenz curve for date t (Kakwani 1990a). If so, a decrease in the Gini coefficient will reduce the measure of poverty for a broad class of additive measures if the poverty line is less than the mean. Ravallion and Huppi (1989) show that this assumption holds well for these data. Then the elasticities $\epsilon_0 = \eta_0(z - \mu)/z$ and $\epsilon_\alpha = \eta_\alpha + \alpha\mu P_{\alpha-1}/(zP_\alpha)$ for $\alpha \geq 1$, and it is readily verified that the elasticity of poverty with respect to the Gini coefficient is positive: $\partial\eta_\alpha/\partial G > 0$ (all α) for these data.

Table 5. *Measured Poverty Levels under Alternate Rates of Inflation and Consumption Growth*
(percent)

Poverty measure and sector	1984 estimate, SUSENAS data	1987 SUSENAS data	1987 Rural inflation 5 percent higher	1987 National accounts growth rates with SUSENAS Lorenz curves
Head-count index (α = 0)				
Urban	12.08	7.32	7.32	9.56
Rural	39.43	26.80	31.01	34.28
Total	33.02	21.65	24.75	29.07
Poverty gap index (α = 1)				
Urban	2.68	1.25	2.68	1.67
Rural	10.32	5.29	6.46	7.45
Total	8.52	4.22	5.46	6.29
Distributionally sensitive index (α = 2)				
Urban	0.92	0.33	0.92	0.48
Rural	3.86	1.57	1.98	2.35
Total	3.17	1.24	1.70	1.92

Note: The poverty meaures are calculated for the total population as $P_\alpha = \sum_{i=1}^{m} P_{\alpha i} \frac{n_i}{n}$ $i = u, r$; and for each sector i as $P_{\alpha i} = \frac{1}{n} \sum_{j=1}^{q_i} \left(\frac{g_{ij}}{z}\right)^\alpha$, where n_i = the population of sector i, q_i = the number of poor individuals in sector i; z = the poverty line; $g_{ij} = z - y_{ij}$, the poverty gap, where y_{ij} is the consumption per capita of the jth household in sector i. A higher α indicates that the measure is more sensitive to lower income among the poor.

Source: Authors' calculations based on data tapes from the National Socioeconomic Surveys, Central Bureau of Statistics, government of Indonesia; national accounts consumption growth rates are from World Bank estimates; estimates of Lorenz curves from Ravallion and Huppi (1989).

higher assumed rate of inflation, measured levels of poverty in 1987 were 9 percent higher for the head-count index and about 15 percent higher for the poverty gap and distributionally sensitive indexes (though the 1987 levels were still between 25 and 45 percent lower than the estimated levels for 1984).

The second case is based on the slower real growth rate implied by the national accounts. We simulated the consumption distribution that would have held in 1987 if mean consumption grew from its 1984 level at a rate indicated by the national accounts (5 percent over the three years according to World Bank estimates) while the Lorenz curve implied by the 1987 SUSENAS was maintained. Thus the SUSENAS data is only used to assess how relative inequalities changed over the period. Under this assumption of lower consumption growth, poverty in 1987 as measured by the three indexes was 21 to 51 percent higher than estimated using the SUSENAS growth rate (table 5). But once again, the estimates still showed a 12, 26, and 39 percent decline in poverty from 1984 to 1987 for the head-count, poverty gap, and distributionally sensitive measures, respectively.

Note that these last calculations assume that the higher growth rate implied by the SUSENAS data is not the outcome of sampling bias in the 1987 survey; undersampling of the poor in 1987 (relative to 1984) would clearly lead to overestimation of the growth rate. The effect of any undersampling on the Lorenz curve is ambiguous, but it is probable that such sampling bias would result in an underestimation of poverty in 1987. We have no basis for systematically assessing this possibility, though with such a large sample size and a well-established and sound sampling methodology, a significant bias in the aggregate Lorenz curve seems unlikely.

VI. Implications for Future Poverty Alleviation Prospects

Some aspects of the methodology used here can throw light on the potential for future reductions in poverty in Indonesia. We can use our 1987 results to estimate the elasticities of poverty to any future distributionally neutral growth in mean consumption. We find that the 1987 growth elasticities are even higher than those for 1984. For example, our estimate for the 1987 elasticity of the poverty gap measure is −4.1, as compared with −2.9 for 1984 (table 4); and for the distributionally sensitive measure it is −4.8 for 1987, versus −3.4 for 1984. Furthermore, recent national accounts data suggest that growth rates of real consumption per capita have increased since the 1984–87 period. Both the higher growth elasticities of poverty and the higher consumption growth rates imply increasing poverty alleviation through any distributionally neutral growth after 1987.

In the 1984–87 adjustment period, Indonesia's consumption growth was maintained at the expense of investment. Sustainable future consumption growth will clearly require that investment be revived. Furthermore, the potential reduction in poverty from even substantial consumption growth may not materialize if it is accompanied by a deterioration in overall equity. The deterioration in equity needed to reverse the gains from growth may be quite modest. To illustrate, we have estimated the poverty measures resulting from 5 and 10 percent increases in mean consumption after 1987, assuming first that the 1987 Lorenz curve holds, and second, that inequality increases to its 1984 level (the national Gini index would rise from 0.321 to 0.331—table 3).

We find that the aggregate head-count index would fall from 21.7 percent to 19.3 percent as a result of a distributionally neutral 5 percent increase in real consumption per capita after 1987 (see table 6). If, however, the same increase in the mean were associated with a return to the less equitable 1984 Lorenz curve, the resulting head-count index would be 21.1 percent, only slightly lower than its 1987 level. Furthermore, the same comparison using the distributionally sensitive poverty measure indicates that poverty would *increase*. Given a 10 percent increase in the mean, the head-count and poverty gap measures would generally be lower even if inequality increases to its 1984 level, although this is not true for the distributionally sensitive poverty measure.

Table 6. *Projected Levels of Poverty Given Increased Mean Consumption under Alternate Assumed Distributions, Indonesia, post–1987*
(percent)

Poverty measure and sector	*1987*	*5 percent increase in mean real consumption*: *No change in distribution*[a]	*5 percent increase in mean real consumption*: *Increased inequality*[b]	*10 percent increase in mean real consumption*: *No change in distribution*[a]	*10 percent increase in mean real consumption*: *Increased inequality*[b]
Head-count index ($\alpha = 0$)					
Urban	7.32	5.83	6.99	4.65	5.82
Rural	26.80	23.24	25.73	19.84	22.65
Total	21.65	19.29	21.07	16.48	18.49
Poverty gap index ($\alpha = 1$)					
Urban	1.25	0.95	1.40	0.74	1.16
Rural	5.29	4.34	5.82	3.52	4.94
Total	4.22	3.48	4.63	2.79	3.90
Distributionally sensitive index ($\alpha = 2$)					
Urban	0.33	0.27	0.50	0.22	0.42
Rural	1.57	1.27	2.00	0.98	1.67
Total	1.24	0.93	1.53	0.72	1.26

Note: The poverty meaures are calculated for the total population as $P_\alpha = \sum_{i=1}^{m} P_{\alpha i} \frac{n_i}{n}$ $i = u, r$; and for each sector i as $P_{\alpha i} = \frac{1}{n} \sum_{j=1}^{q_i} \left(\frac{g_{ij}}{z}\right)^{\alpha}$, where n_i = the population share of sector i; q_1 = the number of poor individuals in sector i; z = the poverty line; $g_{ij} = z - y_{ij}$, the poverty gap, where y_{ij} is the consumption per capita of the jth household in sector i. A higher α indicates that the measure is more sensitive to lower income among the poor.

a. Assumes 1987 Lorenz curve.

b. Assumes 1984 Lorenz curve.

Source: Authors' calculations based on data tapes from the National Socioeconomic Surveys, Central Bureau of Statistics, government of Indonesia; estimates of the Lorenz curves from Ravallion and Huppi (1989).

Is inequality likely to have deteriorated since 1987? The sharp increase in rice prices during 1987 and 1988 (associated with poor harvests and a reluctance by the government to import rice) is probably the main recent event which could have threatened continued poverty alleviation, although its effect on aggregate poverty is not obvious. Even if rice price increases were fully passed on to the incomes of rice producers, evidence from Java for 1981 (Ravallion and Van De Walle, forthcoming, a) suggests that all distributionally sensitive measurements of poverty would show an increase with higher rice prices. The effects are ambiguous for measures of poverty which are not sensitive to the welfare of the poorest of the poor. It remains to be seen whether adverse effects on the poor of changing relative prices have been sufficiently large or persistent to seriously jeopardize continued poverty alleviation through growth in Indonesia.

VII. Conclusions

The measurement of poverty at one point in time is fraught with difficulty, and the comparison of poverty levels at two points in time adds even further problems. We have described a number of tools for empirical analysis which allow researchers to test the sensitivity of poverty assessments to measurement assumptions, and to decompose observed changes in aggregate poverty, so as to assess their sectoral, demographic, and distributional composition, and their possible future evolution. We have based poverty measures on distributions of household consumption per person, adjusting for inflation using the consumer price index, though modifying the underlying expenditure weights to accord more closely with the spending patterns of the poor. We have drawn on the recent literature on poverty analysis to analyze a range of poverty measures, using dominance conditions to rank the distributions of living standards.

We conclude that aggregate poverty in Indonesia decreased over the 1984–87 period for both urban and rural areas according to comparisons of both income and consumption distributions. For a range of commonly assumed poverty lines for Indonesia, the magnitude of the decline in poverty over the period is impressive. For the most widely used poverty measure, the head-count index, the percentage of the population identified as poor fell from 34 percent in 1984 to 22 percent in 1987. Such estimates can be quite sensitive to how poverty is measured, however, and particularly to the choice of a poverty line. In the Indonesian case, for example, where the commonly used poverty line lies near the mode of consumption distribution, slight shifts of the distribution, or slight errors in measuring the poverty line, will produce large changes in measured levels of poverty when using the head-count index. The quantitative result is similarly sensitive to possible errors in the estimated rate of growth of real mean consumption or the relevant rate of inflation for the rural poor. Using the lower growth rate of private consumption derived from national accounts data, measured poverty fell by 12 percent from 1984 to 1987, rather than the 25 percent reflected in the SUSENAS data.

We also find that poverty declined over the period for a very broad class of poverty measures and a wide range of poverty lines. Indeed, in the Indonesian case this conclusion would hold even if one allowed the poverty line to be anywhere between the lowest and highest consumption levels! The assumed rate of inflation would have to be implausibly high or the growth rate in mean consumption implausibly low, in our view, to alter the conclusion that poverty decreased.

Although the caloric intake data is less than ideal (with underestimation being likely at both dates), there is strong evidence that the extent of undernutrition also fell significantly. This holds for both urban and rural sectors over a very wide range of alternative measures of undernutrition, and it holds for any (unknown) interpersonal distribution of nutritional requirements, provided that

this did not also change over the period. The improvement was particularly marked at low calorie intakes.

In summary, although legitimate doubts can be raised about the *size* of the changes involved, the analytical techniques adopted allow us to reach the unambiguous conclusion that poverty and undernutrition in Indonesia continued to decline during the difficult period of the 1980s.

We also presented and applied techniques that allow one to quantify some of the factors underlying the changes in aggregate poverty using two methods of decomposition, one according to sectors, the other according to distributional parameters. The sectoral decomposition of the change in aggregate poverty indicates that gains to the rural sector were very important, particularly for the poorest of the poor. Gains to the urban sector and population shifts from the rural to urban sector contributed to poverty alleviation, but were quantitatively less important than the direct gains to the rural poor. We also found that both increases in average real consumption (holding relative inequalities constant) and a modest improvement in overall equity contributed to poverty alleviation. The growth in average consumption was quantitatively more important than improvements in equity, although less so for the preferred, distributionally sensitive poverty measure.

Further research is required to uncover the causes of Indonesia's success in poverty alleviation during an adjustment period that could have worsened the lot of the poor. Some possible clues can be identified here. Continued growth in average real private consumption despite the cuts in government expenditure during the period appears to have been possible, at least in part, because government investment spending bore the brunt of the cuts. And where government consumption was cut, programs which were of greatest benefit to the poor were protected. Because of the predominance of poverty in the rural areas, the gains to the rural farm sector were crucial, and so policy adjustments favoring that sector, such as the devaluations of the exchange rate, probably were important. Indonesia's recent economic history also played a role. By the mid-1980s, past growth with relatively low and decreasing inequality allowed seemingly small improvements in the distribution of consumption to generate a relatively large decline in aggregate poverty. Thus Indonesia's recent economic history created favorable conditions for maintaining the country's success in reducing poverty during an adjustment period, provided that at least modest and equitable growth in private per capita consumption could be maintained.

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Topics in Land Rights and Land Taxation

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Introduction: Agricultural Taxation and Land Rights Systems

Karla Hoff

In the rural sector of developing countries, imperfections in risk and land markets and the limited number of market transactions that can give rise to tax valuation are important constraints on tax policy and economic efficiency. One of the challenges of development economics is to design policies that economize on information costs and that build on the comparative advantages of, and complementarities between, state and private actions in mitigating market failures.

These objectives frame the symposium that follows on land taxation and land policies. The symposium focuses on the following policy questions:

- How should the absence of perfect risk markets and the informational requirements of land taxation affect the design of taxes in the rural sector (issues addressed in the articles by Hoff and Skinner)?
- Under what conditions will government intervention in customary or extra-legal land rights systems increase welfare (as examined in the articles by Feder and Feeny and Migot-Adholla and others)?

I. Agricultural Land Taxation versus Output Taxation

In most developing countries, private institutions for spreading and pooling risks are localized and fragmented. And government attempts to provide general crop insurance have not been successful because it is so difficult to monitor farmers' care of their crops (Newbery 1989).

The imperfections in insurance institutions have significant implications for tax policy. Traditional theory would argue that lump sum land taxes are an ideal tax on efficiency grounds. The article by Hoff, however, demonstrates that if risk markets are imperfect, government should use a portfolio of taxes including low output taxes.

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The intuition behind this result is straightforward. An output tax is implicitly a tax on a farmer's *average* output and an insurance policy providing for a payment from government to farmer in bad years (when output is below average) and an insurance premium from farmer to government in good years. An output tax thus imperfectly substitutes for missing risk markets. It reduces both the aggregate amount of risk in the economy through risk pooling and the aggregate cost of bearing a given risk through risk spreading. It is shown that for a sufficiently small output tax, the welfare gain from the insurance will always exceed the loss due to the distortion of the output price. This means that there is always an optimal output tax that is positive. This result generally holds even if the land tax is indexed to regional output or land is farmed under sharecropping.

Imperfect risk markets undermine another standard result in tax analysis regarding lump sum taxes (Hoff 1990). The *New Palgrave* states that "A feature of lump sum taxation is that what taxpayers bear is exactly balanced (in monetary terms) by what the fisc gains" (de V. Graaff 1987, pp. 251–52). For most people, the smaller one's wealth, the higher his or her absolute cost of bearing a given risk.[1] This means that if risk markets are incomplete, a lump sum tax program will increase the cost of risk to the taxpayers; there will be excess burden. One can easily think of examples of other cases of excess burden arising under lump sum taxes. If, for instance, small farmers are rationed in the credit market, then a lump sum tax on farmers, by reducing the scope for self-finance, will exacerbate the distortions in the credit market.

These are cautionary notes that argue, on efficiency grounds, against regressive land tax–transfer systems and against exclusive reliance on land taxation in the rural sector. They are not arguments in favor of the very low reliance on land taxation and high reliance on output and trade taxes characteristic of developing countries (Tanzi 1987). Skinner's simulations (this issue) compare welfare under a pure output tax regime and a pure land tax regime. He shows that a pure output tax regime is unlikely to Pareto-dominate a pure land tax regime except for very high income uncertainty and low tax rates (see his table 1).[2]

As is now increasingly emphasized, a discussion of alternative tax systems is incomplete unless it includes administrative factors (Stern 1982; Slemrod 1990; Besley 1989). Every tax has its own information requirements. Taxes on marketed output economize on information: the tax collector requires knowledge only of the farmer's marketed sales. Taxes on land, to be equitable, must be based on land quality as well as acreage. Hence land tax administration entails assessing the value of land parcels that, for many developing countries, more likely than not have been obtained outside of formal market channels. (Evidence on the low incidence of land sales in Sub-Saharan Africa is presented in Migot-

1. The simple analytics of the monetary cost of risk are summarized in Newbery (1989).

2. Skinner's simulations are based on the assumption that all output is marketed.

Adholla and others, this issue.) The monetary cost of obtaining information on land values reduces net government revenues from the land tax. Skinner notes that "courts are often swamped by appeals from irate landowners. [It has been suggested that] the administrative capability of the government is overwhelmed if 5 percent of landowners appeal their tax assessment . . . [In one, possibly extreme, case] the administrative cost of the Land Development Tax in Bangladesh during the mid-1980s was more than half the tax revenue."

Any decision on the level of governmental outlays for land tax administration has important effects on such a tax's progressivity. This is because errors in assessment are likely to be regressive. Farmers with high-quality land have an incentive to represent it as low-quality because it is difficult to impose large penalties for underreporting—reasonable people may differ over the "true" value of land. Skinner provides illustrative parameters under which the social cost of raising an additional dollar from land taxes exceeds the social cost of raising an additional dollar from output taxes. In optimal tax policy, as in optimal transfer policy, there is a tradeoff between two evils: deadweight losses induced by distortionary tax–transfer systems and administrative burdens and inequities induced by nondistortionary systems.

II. Land Rights Systems

The last two articles in this symposium focus on the role of government in facilitating the development of land markets and defining property rights. It has been widely assumed that government reform of customary land rights systems is needed, especially in Africa. For example, Robert Seidman, a leading scholar in law and development, wrote: "Undoubtedly, the hardest single rub in all African law lies between the norms of customary land tenure and the demands for development" (Burg 1977, p. 525). Yet evidence is fragmentary on the extent to which African customary land rights systems or, more generally, informal systems of land tenure in fact do reduce productivity. An alternative view, set forth in the article below by Migot-Adholla and others, is that Sub-Saharan customary land rights systems have successfully adapted to increases in population pressure and commercialization of agricultural outputs through a progressive privatization of communal rights. In this view, the binding constraints on African rural development are inadequate technology and limited access to goods markets—not customary land rights systems.

To understand the relation between the last two articles in this symposium, it is useful to characterize land rights systems according to two dimensions—transferability of use rights and security of those rights. These two dimensions are distinct. Tenure insecurity can arise under a regime of perfectly individualized and marketable rights—because of a conflict in land documents or inadequate enforcement of those rights, for example. In an idealized African indigenous system, use rights are perfectly secure but cannot be transferred except

through inheritance. In the idealized Western land rights system, all rights are marketable and the security of rights is high.

Transferability of Land Rights

In most areas of developing countries land use rights are individualized, but a user's freedom to transfer those rights may be limited. The source of such limitations may be norms of customary land tenure or the absence of efficient legal mechanisms for land transactions, such as titles and cadastral surveys. Migot-Adholla and others find for Sub-Saharan Africa that "the distinguishing feature of different tenure regimes . . . revolve[s] around restrictions on the individual holder's ability to transfer land (only among family members, within the lineage or community, or to outsiders; and with or without approval from other lineage or community members), which also tends to coincide with the mode of transmittal (inheritance, gifts or bequest, and sale)."

Their article uses cross-section evidence from Ghana, Rwanda, and Kenya in 1987–88 to examine whether restrictions on the transferability of land are a constraint on productivity. Their finding is that, "controlling for differences in land quality and household characteristics, our regression analysis indicates no relationship between cross-sectional variations in land rights and productivity." This suggests that indigenous institutions provide good substitutes for formal property rights and enforcement mechanisms. The data also provide evidence that Sub-Saharan land rights systems have autonomously evolved to allow greater transferability of use rights where farm production has become commercialized.

In those parts of developing countries where land markets are active, a set of parallel markets—one legal and one extralegal—often exists. Land in the extralegal sector of the economy faces impediments to transfer to the legal sector. In particular, those who have purchased land in the extralegal market are not able to pledge their land as collateral to banks. In a study of farms in illegally occupied forest reserves and on legally owned land in Thailand, the claims of squatters were found to be fairly secure, and the percentage of farmers who had obtained their land through market purchase was similar for the illegal and legal farms (Feder 1989). The main difference between the two types of farmers was that titled farmers had much greater access to institutional credit, and this appeared to be the source of the difference in the land productivity of titled and untitled farms.

Security of Land Rights

Security of land rights is a second dimension along which land rights systems may be characterized. Land rights systems reflect the combined effect of rules, the governmental order that gives them legitimacy, the administrative and judicial institutions that enforce them, and the social norms that support them. Looked at from this point of view, it is easy to see why land rights in many developing countries are insecure: "In developing countries undergoing evolution in all three categories of institutions [constitutional order, institutional

arrangements, and normative behavioral codes], there is the potential for a lack of congruence among the three types of institutions. Thus although the formal legal system may provide for alienability, the transfer of land to persons from another clan or ethnic group may represent a violation of cultural norms. Similarly, although the constitutional order may make provisions for private property rights and there may formally be laws establishing such rights, the corresponding registration and enforcement mechanisms may be largely absent" (Feder and Feeny, this issue).

The obvious cost of insecurity of land rights is that it reduces farmers' investments in land and land's value as collateral. Feder and Feeny highlight a further cost: insecurity of land rights distorts the price of land relative to capital. As insecurity of land rights increases, farmers will invest less in both land and capital used on land. But because the supply of agricultural land is highly inelastic, the reduction in demand for land will be offset by a reduction in its price. At the higher capital-land price ratio, the capital intensity of farming will fall. (Such effects are fully traced through in a formal model in the appendix to Feder and Feeny.)

Policy Measures

Governments have intervened extensively in land rights systems with the objective of increasing the marketability and security of land rights. Titling is one of the most common methods for this purpose. Migot-Adholla and others provide striking evidence that titling is not effective, however, if a market in land violates strong indigenous tenure systems. Kenya provides a test case for land tenure reform because it is the only Sub-Saharan African country with more than thirty years' experience with a national land registration program. Migot-Adholla and others surveyed more than 100 land parcels in each of two traditional African farming areas in Kenya. In one area, 75 percent of the parcels were titled but only 8 percent were deemed salable by the operator. In the second area, only 14 percent were titled but 67 percent were deemed salable. Because land rights systems depend on social norms, land titles alone do not create a market. The Kenyan evidence suggests that in areas where strong indigenous land rights systems exist that preclude marketability of rights, land registration and titling programs will not be effective in shifting those systems toward the Western model.

Where, however, land markets do exist, government has an indispensable role in promoting transferability and security of land rights. Governments can do so by recognizing the reality of extralegal markets and providing efficient mechanisms for land transactions, such as registers, court systems, and regulations concerning mortgages and leases.

Imperfections in Land and Credit Markets and the Dynamics of Inequality

We noted above that where land is transferable, landownership will be valued not only for its yield, but also for the improvement in access to formal credit that it affords. The pledging of land as collateral enhances the efficiency of the credit

market. Surprisingly, it *reduces* the efficiency of the land market. Feder and Feeny derive the collateral premium on land in a formal model; Feder (1989) estimates its magnitude in Thailand. Because of the collateral premium, individuals will not be able to buy land through assumption of debt, because the yield from the land will not cover the market price. The converse result is also true: individuals who are not rationed in the credit market will not wish to buy as much land as they otherwise would. Recent work has begun to explore the implications of such distortions on the dynamics of class formation and the stability of redistributive land reforms (see Braverman and Stiglitz 1989 and Carter 1989, and, for a contrasting view, Lanjouw and Stern 1989).

III. Concluding Remarks

The articles contained in this symposium provide insights into the consequences for tax policy of risk market imperfections and of imperfect land valuation. They also advance the debate on the scope for welfare-improving government interventions in land rights systems. Governments, in general, have a comparative advantage in increasing land rights security and the efficiency of land transactions; the private sector has an indispensable role in creating the normative behavioral codes that underlie land rights systems. Finally, by formalizing land rights systems in a way that is useful in empirical work, these articles make contributions to methodology in the analysis of land rights systems.

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Land Taxes, Output Taxes, and Sharecropping: Was Henry George Right?

Karla Hoff

Economists have generally argued that if a land tax is administratively feasible, then to increase efficiency it should be used to the exclusion of output taxes. This article shows that underlying this policy prescription is the assumption that institutions for pooling and spreading production risks are perfect. When account is taken of the imperfections in those institutions, some use of output taxes will be Pareto superior to a pure land tax regime and may induce higher output, as well. Henry George was wrong! These results generally apply even when the land tax is indexed to regional output, and when land is farmed under sharecropping. Even in these cases, a move from a pure land tax to a mix of land and low output taxes will reduce preexisting distortions in both consumption and production arising from the imperfection in risk markets.

Economists have long argued that a tax on unimproved land is, on efficiency grounds, an ideal tax. In developing countries where land rents are an important source of rural income, a standard recommendation for increasing efficiency is thus to use a land tax to the exclusion of agricultural output taxes.[1]

This article will show that lying behind this policy prescription is an assumption that landowners have sufficient access to market or nonmarket institutions for the exchange of risks that they maximize their expected profits from production, independent of risk aversion. For most developing countries this is an extraordinary assumption. Rural financial markets generally provide only limited spreading and pooling of production risks (see, for example, Udry 1990, and Siamwalla and others 1990), whereas these risks represent a large fraction of landowners' wealth. Many studies attest to the role of nonmarket institutions—marriage, remittances, patron-client relationships and tenancy—in spreading and reducing risk; but despite such arrangements, farmer's production decisions reflect risk aversion (see Rosenzweig 1988 and citations therein).

The main finding of this article (proposition 1; see below) is that some use of output taxes will be Pareto superior to a pure land tax regime if institutions for

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1. See, for instance, Newbery (1987, p. 381): "The obvious empirical question to ask is how desirable a crude land tax would be from an equity viewpoint (because its efficiency is not in doubt)."

sharing production risks are imperfect.[2] The result here is an application of the theorem of the second best: that is, if some of the marginal conditions required for efficiency cannot be met in an economy, then the other marginal conditions may no longer be desirable.[3] Unlike the model economy in which the classical economists analyzed the effect of land and output taxes, a developing country is hobbled by a limited set of institutions for risk sharing. An output tax alleviates the consumption and production distortions which arise in the absence of a perfect insurance market. For that reason, the introduction of a small output tax will increase welfare. Henry George was wrong!

A second finding of this article (proposition 2; see below) is that there exist plausible conditions under which an increase in output taxes, compensated by a decrease in land taxes that keeps the farmer's welfare unchanged, increases his labor supply. Under these conditions, the farmer's supply response to the decrease in risk will more than offset his supply response to the decrease in expected return.

In an economy with imperfect insurance markets, an output tax provides a financial intermediation service. But why doesn't the market provide such services? And what advantage does government have that enables it to provide insurance—via output taxation—that other institutions cannot? Four responses can be offered.

First, the random factors generating income risk are likely to be correlated across farmers in a given region, so that rural financial markets that operate over small geographical areas can provide only limited risk reduction. But if the cost of monitoring and enforcement rises sufficiently steeply with distance, financial markets that operate over large regions will not be profitable. Empirical evidence from Africa and Asia suggests a high degree of geographical segmentation in rural financial markets, even when government intervenes directly in those markets (Udry 1990, Siamwalla and others 1990, Binswanger and Khandker 1989, and Feder and Feeny, this issue).

Second, adverse selection impedes private insurance. If private crop insurance were offered, landowners that had low-quality land (land quality being unknown to insurance agents) would buy the insurance in disproportionate numbers, drive up premiums, and make the insurance unattractive to the average farmer (see Rothschild and Stiglitz 1976). Government, unlike the market, can overcome the adverse selection problem by creating mandatory programs, including tax policies.

Third, a low output tax plays less havoc with incentives than does a general crop insurance program. Because it is so difficult to monitor farmers' care of

2. Related results have been obtained for a wage tax in Eaton and Rosen (1980) and for an interest income tax in Varian (1980). This article provides a proof that clarifies the basis for the kind of results obtained in their papers.

3. A famous early demonstration of this point in the context of the debate over direct versus indirect taxes is in Little (1951, pp. 580–84). The classic reference is Lipsey and Lancaster (1956).

their crops, general crop insurance has not been successful (Newbery 1989). An anecdote cited in Newbery (p. 288) illustrates the incentive problem: "'It was further alleged by villagers that some of the participants [in the Gujarat Crop Insurance Scheme for Hybrid-4 Cotton] had avoided interculturing, weeding, application of the last dose of fertilizers, etc., when they realized that they would not obtain the expected [and insured for] yield.'"

Fourth, government is usually in a better position than private insurers to insure collective risks, such as drought, that directly affect a large proportion of the rural sector. Through tax and debt policy and privileged access to international capital markets, the scope of consumption smoothing that governments can undertake across time periods is much greater than that possible in a private financial market.

This article begins with a proof of propositions 1 and 2 for the case of owner-operated farms. Section II extends proposition 1 to cover a land tax indexed to the value of the region's aggregate harvest: it demonstrates that the Pareto-efficient mix of an output tax and an *indexed* land tax will include the output tax provided that farmers' output risks are not perfectly correlated. Section III extends proposition 1 to farms under tenancy cultivation. Here taxes will affect the contractual relations between landlords and tenants, but the Pareto efficiency of a mix of low output taxes with the land tax remains robust.

I. A Model of Owner-Operated Farms

Consider a family farm with acreage T. Output depends on T, the number of family workers, L, the level of effort, e, supplied by each worker, and the realization of a random variable, ϵ, that reflects weather, pests, and other shocks. Define units so that the expected value of the random variable, $E\epsilon$, is 1. The production function of the agricultural good is

$$Q = \epsilon F(eL, T)$$

Assuming constant returns to scale, output per unit of land, denoted by the function $f(\quad)$, will depend only on the labor-land ratio:

$$(1) \qquad \frac{Q}{T} = \epsilon F\left(\frac{eL}{T}, 1\right) \equiv \epsilon f\left(\frac{eL}{T}\right)$$

with $f' > 0$, $f'' < 0$, and $f(0) = 0$.

The family maximizes its joint expected utility, U. Define units so that L, the number of family workers, is unity; and let output be the numeraire. Output is taxed at rate τ, and land is taxed at the per acre rate Γ. Thus family income after taxes is

$$y = T\left[\epsilon f\left(\frac{e}{T}\right)(1 - \tau) - \Gamma\right].$$

Assume, for simplicity, that the disutility of labor effort, $v(e)$, is independent of income. The family chooses its labor effort to solve

$$\max_{e} \; U = \mathrm{E}u(y) - v(e) \qquad (u' > 0, u'' < 0, v' > 0, v'' > 0)$$

with first-order condition for an interior solution

$$\frac{\partial U}{\partial e} = \mathrm{E}(u'\epsilon)(1 - \tau) f' - v'(e) = 0 \tag{2}$$

and second-order condition

$$\Delta \equiv \mathrm{E}(u'\epsilon)(1 - \tau)\frac{f''}{T} - \mathrm{E}u''[(1 - \tau)\epsilon f']^2 - v'' < 0 \tag{3}$$

This model abstracts from the farmer's decisions other than his labor-leisure choice, and also from all avenues that he might have to insure himself against output risk. Obviously farmers do engage in consumption smoothing through hoarding and credit markets (see Deaton 1989). My qualitative results will depend only on the assumption that the opening of a perfect insurance market would not be redundant, an assumption that I formalize below.

The Pareto-Efficient Mix of Land and Output Taxes

A simple way to test the Pareto efficiency of a tax regime is to ask whether there exists a set of tax changes that would increase the social value of government revenues and leave taxpayer expected utility unchanged at some initial level, $\bar{U}$. Results of such a test would be unaffected, and the notation simplified, if we treat the case of N farmers, each of whom has land area T and identically distributed shocks ϵ_i. In this case government revenues from the agricultural sector are

$$G = T\left[\tau \sum_{i=1}^{N} \epsilon_i f\left(\frac{e}{T}\right) + N\Gamma\right].$$

Let the social value of government revenues be $\mathrm{E}W(G)$, with $W' > 0$ and $W'' \le 0$. We assume that social valuation reflects individual valuations. The $W(G)$ function is intended to capture the notion that ultimately individuals are the beneficiaries of government expenditures.

If a pure land tax regime is Pareto efficient, then the maximization of $\mathrm{E}W(G)$,

$$\max_{\tau} \mathrm{E}W\left\{T\left[\tau \sum_{i=1}^{N} \epsilon_i f\left(\frac{e}{T}\right) + N\Gamma\right]\right\} \tag{4}$$

subject to

$$U = \bar{U} \tag{5}$$

will have a solution at a point of no output taxes: $\tau = 0$.

Note that along the constraint equation 5 we have

$$dU = \frac{\partial U}{\partial \tau} d\tau + \frac{\partial U}{\partial \Gamma} d\Gamma + \frac{\partial U}{\partial e} de = 0.$$

The value of the term $\partial U/\partial e$ is zero because the farmer is optimizing with respect to his effort choice (equation 2). Rearranging the above (and writing out the partial derivatives of utility with respect to the two tax rates) yields the expected-utility-neutral tax changes:

$$-\left(\frac{d\Gamma}{f d\tau}\right)_{\bar{U}} = \frac{E(u'\epsilon_i)}{Eu'} < 1. \tag{6}$$

The inequality in equation 6 means that to keep the farmer's welfare unchanged after raising the expected output tax burden by, say, one dollar, it suffices to reduce the land tax by less than one dollar. This is because an output tax, falling most heavily on the farmer when his income is greatest and least heavily when it is lowest, provides the farmer an insurance benefit. But is such insurance Pareto efficient? It will be if such a change in the mix of output and land taxes increases the social value of government revenues, $EW(G)$.

Differentiating $EW(G)$ in equation 4 with respect to τ and using equation 6 to keep the farmer's welfare constant yields[4]

$$\left[\frac{dEW}{d\tau}\right]_{\bar{U}} = NTfEW'\left[\sum_{i=1}^{N}\frac{\epsilon_i}{N} - \frac{E(u'\epsilon_i)}{Eu'}\right] + \tau f'\left[\frac{de}{d\tau}\right]_{\bar{U}} E\left(W'\sum_{i=1}^{N}\epsilon_i\right) \tag{7}$$

The right-hand side above is the sum of two terms. The first term is the effect of the transfer of risk. To see this, rearrange it as

$$NTfEW'\left[\frac{E\left(W'\sum_{i=1}^{N}\frac{\epsilon_i}{N}\right)}{EW'} - \frac{E(u'\epsilon_i)}{Eu'}\right]$$

The expression in brackets is the difference between the marginal social value of the pooled risk and the marginal private value of each farmer's risk. The difference would be zero if a perfect market for production risks existed or if the opening of a such a market would be redundant (as when remittances among members of extended families provided perfect risk pooling and sharing). In either case, each agent in the economy would exchange production risks until his valuation of those risks at the margin was the same as that of any other agent.

But in an imperfect risk market, individuals will differ in their marginal valua-

4. The restrictions on the density function and preferences that guarantee that $(de/dt)|_{\bar{U}}$ defines the farmer's choice of effort and that equation 4 is everywhere concave in τ are summarized in Hart and Holmstrom (1987, pp. 84–87).

tions of risk. As long as the government's insurance opportunities exceed those of individuals, the condition

$$\frac{E\left(W'\sum_{i=1}^{N}\frac{\epsilon_i}{N}\right)}{EW'} \geq \frac{E(W'\epsilon_i)}{EW'} > \frac{E(u'\epsilon_1)}{Eu'} \tag{8}$$

will hold. The first inequality is strict if individual risks are less than perfectly correlated. In that case, output taxes enable the rural sector to pool risks not pooled in the market. Output taxation serves, in part, the need that would be met by a crop insurance program, while avoiding the information problems intrinsic to the operation of a private insurance market.

The second inequality in equation 8 incorporates the presumption that government (i) has privileged access to international financial markets, (ii) can spread rural risks to the urban sector by domestic spending policy, and/or (iii) can spread risk across time through domestic debt and tax policy. The government resource constraint for the rural sector is not its revenues from the rural sector in any year, but an amount that reflects the tax capacity of both rural and urban sectors over the medium or long term. Thus, the benefit function $W(G)$ should display significantly less risk aversion than the farmer's utility of income function, $u(y)$.

Finally, the role of government in financing public investment goods would also tend to ensure that the second inequality is strict. To see this, let K represent public investment. Most simply, suppose that farmer's welfare is

$$U(y,e,K) = Eu(y) - v(e) + \phi(K), \text{ with } \phi' > 0 \text{ and } \phi'' < 0$$

and assume that $W(G)$ depends linearly on the $\phi(K)$ functions of the agents in the economy. The capital stock in any period depends on the stock in the previous period plus the change arising from new government spending. If this change is a small part of the total, then the social benefit function $W(G)$ will be approximately risk neutral. A single strict inequality in equation 8 is necessary and sufficient to make the first term in equation 7 strictly positive.

The first term in equation 7 reflects the direct benefits of risk pooling and risk spreading, whereas the second term reflects the incentive effects of the output tax. Government is concerned with how a change in output tax rate will affect effort and, hence, output tax revenues. Starting from a pure land tax regime, the government initially is collecting no money from output taxes and therefore is not concerned with the change in effort. The second term vanishes. Hence, $(dEW/d\tau(G))\,|_{\bar{U},\,\tau=0} > 0$, which proves

Proposition 1. If farms are operated by landowners and the opening of a perfect risk market would not be redundant, then the Pareto-efficient tax structure will entail a positive output tax.

Proposition 1 holds independent of the level of government revenues, G. It applies equally to a tax on marketed, exported, or total output, because in any

of these cases the insurance benefit of the tax (the first term in equation 7) is the only first order effect at $\tau = 0$. It also applies where effort is provided by hired labor, as can be easily verified.

It is tempting to call the second term in equation 7 the "distortion" in the effort-leisure tradeoff caused by the output tax. In general this is not correct. The sign of the second term is the same as the sign of $\tau de/d\tau_{\bar{U}}$. As I show in the next section, there exists a set of reasonable conditions under which this term is strictly positive—which means that an increase in the output tax rate increases expected output. Under those conditions, incremental substitution of an output tax for a land tax will reduce not only distortions in the allocation of consumption, but also distortions in the labor-leisure tradeoff arising from imperfections in the risk market.

In a set of simulations that take account of consumption but not production benefits from risk pooling, Jonathan Skinner (in this issue) finds that a pure output tax regime Pareto-dominates a pure land tax regime for sufficiently highly risk-averse taxpayers.

Equation 7 provides a simple condition characterizing the optimal mix of land and output taxes. Because $(dEW/d\tau)_{\bar{U}} = 0$ is necessary for Pareto efficiency, the Pareto efficient tax mix has the property that

$$(9) \qquad -\tau \frac{f'}{Tf}\left[\frac{de}{d\tau}\right]_{\bar{U}} = 1 - \frac{Eu'\epsilon_i/Eu'}{E\left(W'\sum_{i=1}^{N}\frac{\epsilon_i}{N}\right)/EW'}$$

From equation 8, the right-hand side of equation 9 is strictly positive for $\tau < 1$. Hence equation 9 implies that to achieve the optimal mix of output and land taxes, a government will set the output tax sufficiently high to make $\tau(de/d\tau)_{\bar{U}} < 0$. At the optimum, the insurance benefits of an increase in the output tax (the right-hand side of equation 9) are just offset by the loss in government revenues arising from the discouragement of effort (the left-hand side of 9).

The Supply Effect of Changing the Mix of Land and Output Taxes

If a perfect insurance market existed, all risks would be tradable and production decisions would depend only on market prices (including market prices for risk). If the insurance market is imperfect, not all risks are priced and production decisions depend, in part, on the decisionmaker's risk preferences. In that case, I suggested above that substitution of an output tax for a land tax can increase effort by reducing the decisionmaker's risk. This section derives that result.

The farmer equates his marginal rate of substitution between income and effort (v'/Eu') to the expected return to effort after taxes less an amount that depends on risk and risk aversion. To see this, the first-order condition for effort in equation 2 can be rewritten as

$$(10) \qquad \left.\frac{dy}{de}\right|_{\bar{U}} = \frac{v'}{Eu'} = (1-\tau)f' - (1-\tau)f'\left[\frac{-\text{cov}\,(u',\epsilon)}{Eu'}\right]$$

This last term corresponds to the farmer's *marginal risk premium* with respect to effort, which is the highest amount that he would pay to be guaranteed the expected value of his marginal productivity. (See the appendix for a proof.)[5]

Intuition suggests that risk may either decrease labor effort because it makes its reward less certain (so that the marginal risk premium rises), or increase labor effort because it threatens the farmer's minimum standard of living (so that Eu' and hence the shadow value of income rises, which reduces v'/Eu' in equation 10).

Formally, the effect of varying levels of output tax on labor effort $(de/d\tau)_{\bar{U}}$ can be evaluated by differentiating the first-order condition, equation 2, with respect to the output tax rate using equations 3 and 6:

$$(11) \qquad \left(\frac{de}{d\tau}\right)_{\bar{U}} = \frac{f'}{-\Delta}E\left\{-u'\epsilon + \bar{T}u'A(1-\tau)f\left[\epsilon^2 - \frac{\epsilon E(u'\epsilon)}{Eu'}\right]\right\}$$

where A is the absolute risk aversion function, $-u''/u'$. This equation shows the change in effort in response to an increase in the output tax and a fall in the land tax that keeps the farmer's expected utility constant. The direction of change (the sign of equation 11) will be the same as the sign of the expression in curly brackets.

The first term in curly brackets represents the individual's valuation of the drop in the after-tax price of output: it is negative.

The change in tax regime also induces a decrease in risk. This is captured in the second term within curly brackets, which is ambiguous in sign.[6] Consider three cases, which illustrate the response at different values of risk aversion and output taxes.

Case 1. As output taxes approach 100 percent ($\tau \to 1$), the farmer's welfare becomes independent of his output fluctuations. The second term within curly brackets drops out, so that $(de/d\tau)|_{\bar{U}}$ is negative.

Case 2. If relative risk aversion, $u''y/u'$, denoted by R, is constant and land taxes approach zero, then the second term within curly brackets again vanishes:

$$RE\left[u'\left(\frac{\epsilon - Eu'\epsilon}{Eu'}\right)\right] = 0$$

This means that investment in effort depends only on the mean return, not its riskiness, so $(de/d\tau)|_{\bar{U}}$ is negative.

5. Again, nothing essential is changed if the marginal unit of effort is provided by a hired hand. Let the utility function of the hired hand be $U_w = u_w(y_w) + v_w(e_w)$, and let $u(y)$ still denote the landowner's utility of income. Then the analog to equation 10 is

$$\left.\frac{dy_w}{de_w}\right|_{\bar{U}} = \frac{v'_w}{u'_w} = (1-\tau)f'\left[1 + \frac{\text{cov}(u', \epsilon)}{Eu'}\right]$$

6. The general case of mean-utility-preserving increases in risk is treated in Diamond and Stiglitz (1974). They show that the effect of an increase in risk on any action will be unambiguous only if the derivative of utility with respect to that action is strictly concave or convex in utility.

Thus, in cases 1 and 2, a compensated increase in the output tax will reduce effort, just as in the perfect markets models analyzed by the classical economists. Let (τ_0, Γ_0) represent the original tax regime in figure 1, and let $e(\tau_0, \Gamma_0)$ represent the farmer's effort choice at that tax regime (the solution to the first-order condition in equation 2). The change in tax mix toward higher output taxes and lower land taxes induces a leftward shift in the expected utility function, illustrated in figure 1.

Case 3. If absolute risk aversion, A, is constant, the second term within the curly brackets in equation 11 can be rewritten as

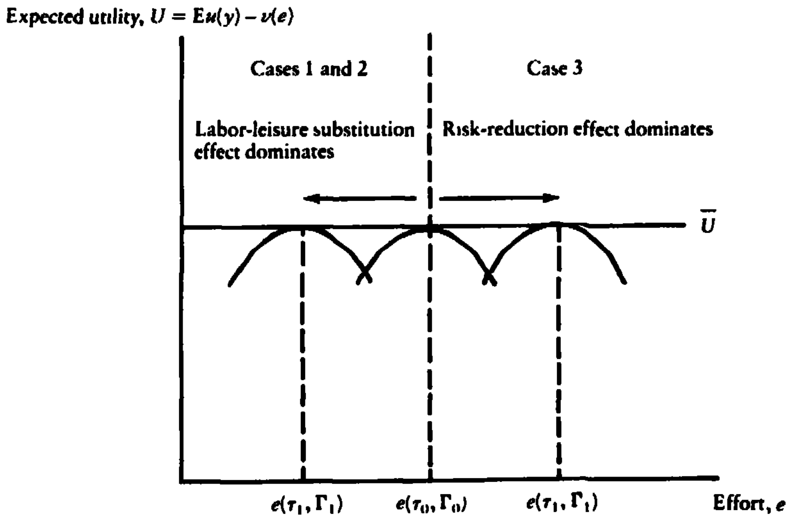
$$(12) \qquad TA(1-\tau)f\left\{ E(u'\epsilon^2) - \frac{[E(u'\epsilon)]^2}{Eu'} \right\} > 0$$

In this case, the insurance effect of a shift to output taxes will increase effort.

The sign condition in equation 12 follows from the Schwarz inequality, which states that for any two random variables X and Z defined on the same space, $E(X^2)E(Z^2) \geq [E(XZ)]^2$ with equality only if X is proportional to Z. Let $X = \sqrt{u'}$ and $Z = \sqrt{u'}\epsilon$. Then the Schwarz inequality becomes $Eu'E(u'\epsilon^2) \geq [E(u'\epsilon)]^2$, which implies that the left-hand side of inequality 12 is nonnegative and is strictly positive unless $\sqrt{u'}\epsilon$ is proportional to ϵ. Equivalently, it is strictly positive unless output is riskless.

For sufficiently high-risk or absolute risk aversion or after-tax expected out-

Figure 1. *The Effect on Labor Effort of an Increase in Output Taxes and a Decline in the Land Tax that Keeps Utility Constant*



Note: Γ = land tax per acre; τ = output tax in percent. In case 1, τ_0 = 100; in case 2, Γ_0 = 0 and relative risk aversion is constant; and in case 3, absolute risk aversion is constant and income risk is large.

put $[T(1 - \tau)f]$, the positive effect on effort of the reduction in income fluctuations (captured in inequality 12) will exceed the negative substitution effect $[-E(u'\epsilon)$ in equation 11], and effort will be a rising function of the output tax. Thus, for some positive output tax $\tau < 1$, an *increase* in output tax compensated by a *reduction* in land tax will induce the rightward shift of the farmer's utility functions, illustrated in figure 1, the opposite of the shift that the classical economists would have predicted. My results are summarized below:

> *Proposition 2.* If farms are operated by landowners and the opening of a perfect risk market would not be redundant, then the output effects of changes in the mix of land and output taxes (holding the landowner's expected utility constant) are ambiguous. For example, (i) if landowners have constant *relative* risk aversion, a higher output tax will reduce expected output; and (ii) if landowners have constant *absolute* risk aversion and risk and risk aversion are sufficiently great, then a higher output tax will increase output over some range of output taxes, $0 < \tau < 1$.

It is well known that income effects of taxation also increase labor effort; that is, leisure is a normal good. Hence, the surprising ability of an output tax to increase output is strengthened if the tax is not compensated. Reconsider, for example, case 2, in which relative risk aversion is constant and land taxes approach zero. Using equation 11:

$$\text{sign}\ de/d\tau = \text{sign}\ [Eu'\epsilon(R - 1)]$$

so that if $R > 1$, an uncompensated output tax increases labor effort (for a comparable result using a sharecropping model, see Braverman and Stiglitz 1989, p. 9).

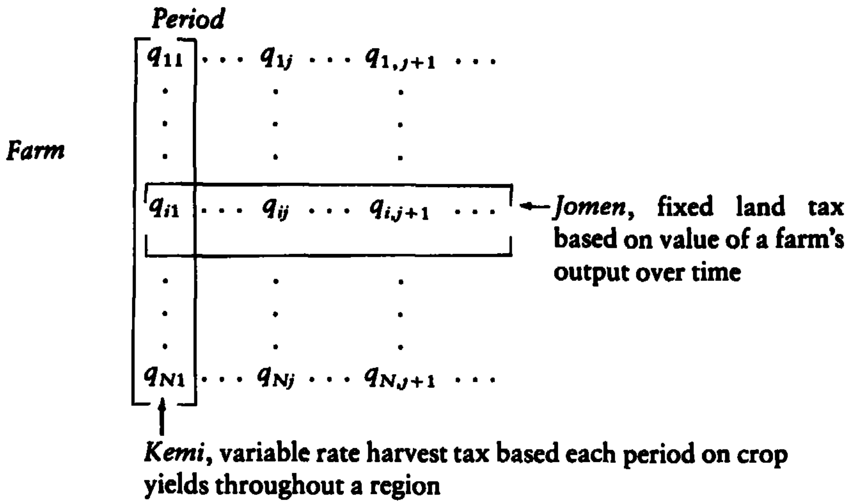
II. THE JOMEN AND THE KEMI

Newbery informally suggests: "The problem [posed for land taxation by] fluctuating income can be met by linking last year's tax liability to the value of aggregate output throughout the country or region" (1987, p. 380). This form of land taxation has been used in many countries. In Japan, for much of the Tokugawa period land taxes were collected as a variable levy based on estimates of aggregate crop yields prorated according to land quality and area. This variable levy, called the *kemi*, was replaced by a lump sum tax on land value, the *jomen*, toward the end of the Tokugawa period (Otsuka, Chuma, and Hayami 1989, p. 20).

This section first compares the risk and incentive properties of the *jomen* and *kemi*. It then demonstrates that, in general, a Pareto-efficient mix of a *kemi* and a simple output tax (τ, as before) will include an output tax.

Let subscript i index farms, $i = 1, 2, \ldots, N$, and let subscript j index time

periods. Farm outputs over space and time can be represented in a matrix



With the simple technology of equation 1 and homogeneous land and labor, a *jomen* amounts to taxing the *i*th landlord on the discounted sum of the *i*th row adjusted for labor costs. A variable aggregate output levy, such as the *kemi*, amounts to taxing the landlord on the sum of a column, adjusted for total labor costs within one period and prorated according to land quality and area. A simple output tax is a tax on the individual cells of the matrix.

A *kemi* permits new possibilities for risk sharing and incentives if farmers' risks in any period are correlated. Suppose that output per worker on farm i in period j is

$$q_{ij} = [g_j + \epsilon_{ij}] f\left(\frac{e}{T}\right) T$$

where g_j is a common random variable, normalized at mean one, and is uncorrelated with the independently distributed individual shocks, ϵ_{ij}:

$$\text{(13)} \qquad \mathrm{E}\epsilon_{ij} = \mathrm{E}(g_j \epsilon_{ij}) = \mathrm{E}(\epsilon_{ij}\epsilon_{i'j}) = 0 \quad \text{for } i \neq i'.$$

Finally, suppose that there are a large number (N) of identical family farms (with the number of workers on each normalized at one). All then have the same expected output, $\bar{q}$. Total output in period j (the sum of a column in the output matrix) is

$$\sum_{i=1}^{N} q_{ij} = \bar{q}\left(Ng_j + \sum_{i=1}^{N} \epsilon_{ij} \right).$$

Replacing a *jomen* by a *kemi* that yields the same expected tax revenue induces a mean income-preserving decrease in the landowner's risk:

$$y_{\text{with kemi}} = y_{\text{with jomen}} + k(1 - g_j)\bar{q}$$

where k is the rate of *kemi* tax expressed as a proportion of the aggregate harvest, Σq_{ij}, per unit of land. A *kemi* is thus equivalent to a *jomen* plus an actuarily fair insurance plan. The farmer's insurance receipts are positive if the year is bad for the collective of farmers ($g < 1$), and negative otherwise.

This discussion is not academic. After the *kemi* was replaced by the *jomen* at the end of the Tokugawa period (as part of a general legal reform in property rights in land), bad crop years sometimes saw revolts against the tax (Dore 1959).

Under the assumption that the individual (ϵ_{ij}) and the common (g_j) sources of risk are independently distributed (equation 13), the *kemi* provides risk pooling with nearly perfect incentives. The farmer's choice of effort solves

$$\max_{e} = \mathrm{E}u[(g_j + \epsilon_{ij})f(e/T)T - Tkg_j\bar{q}] - v(e)$$

yielding the first-order condition

$$f'\mathrm{E}\left[u'\left(g_j + \epsilon_{ij} - kTg_j\frac{\mathrm{d}\bar{q}}{\mathrm{d}q_{ij}}\right)\right] = v'$$

Given many small farms, to an individual farmer the effect of an increase in his farm's output on the *kemi* tax will not be perceptible, so that each acts as a price-taker with respect to the *kemi*: $\mathrm{d}\bar{q}/\mathrm{d}q_{ij}$ will be ignored and the risk advantage of the *kemi* comes without cost in incentives. It is apparent that a *kemi* dominates a *jomen* when assumption 13 holds and administrative costs and problems are excluded.

A *kemi* that is levied on the individual farmer will have the further advantage, not captured in this model, of increasing the expected utility cost of poor farm management. Unlike a *jomen* or an output tax, the landowner under the *kemi* will bear increased risk if he fails to take reasonable care to make his land productive. The tax due under the *kemi* will be high in years in which agricultural conditions are generally favorable and low in unfavorable years, so the penalty for poor management will become a random variable.[7]

I return now to the question posed at the beginning of this section: does the land tax in the form of a *kemi* solve the problem of fluctuating incomes? Consider first the Pareto-efficient mix of a *kemi* and a simple output tax. Using a proof virtually identical to that for proposition 1 leads to the following result:

7. The *kemi*'s potential role in reducing slack among landowners is analogous to the role played by the competitive price system in reducing managerial slack: when environmental conditions are good so that output rises, the competitive market price falls and managers who did not take advantage of the good conditions may be forced into bankruptcy (see Nalebuff and Stiglitz 1983).

Proposition 3. The Pareto-efficient mix of an output tax and a land tax at rate k that is indexed to the aggregate regional harvest will entail a positive output tax if (i) individual risk is at least as great as the farmer's share of the common risk, $(1 - k)g$, and (ii) the opening of a perfect risk market would not be redundant.

From the government's perspective, the risk properties of the simple output tax and *kemi* are identical. But from the farmer's perspective, the simple output tax has the advantage that it absorbs his individual risk as well.

There are sharp limits to the ability of the *kemi* to reduce risk if individual farm shocks are negatively correlated within a region. Dropping assumption 13, suppose that $E\epsilon_i\epsilon_{i'} < 0$ for $i \neq i'$. This case would plausibly arise when inputs (such as tubewells, draft animals, and seed qualities) are heterogeneous across farms, so that some landowners cope well with dry weather and others cope well with wet weather. Under a *kemi*, a farmer's tax will be a higher share of his output, the *worse* his relative good fortune. Under these conditions, for some farmers the risk-sharing properties of a *jomen* will be superior to those of a *kemi*. This tends to strengthen the case for combining the indexed land tax with a simple output tax.

III. Sharecropping Economies

Economies adapt to the absence of risk markets by developing institutions that perform the functions that would otherwise have been served by the missing markets. Sharecropping is partly an adaptation to the absence of risk markets. Evidence suggests that in rural areas where the risk-sharing properties of tax instruments are most important, contracts between landowners and workers are likely to be characterized by sharecropping in lieu of simple rental and wage contracts.[8] Hence it is important to ask whether the central results of this article, proposition 1 and its corollary, proposition 3, extend to the case in which land is farmed under sharecropping. To highlight the main issues, I treat the linear sharecropping contract here. My qualitative results will also apply to a nonlinear sharecropping contract, which can be analyzed along the lines set forth in Hart and Holmstrom (1987, p. 78).

Taxation in the presence of sharecropping is a nested principal-agent problem. The landlord can be viewed as a local tax authority whose "tax system" will change to take advantage of changes in the government's tax regime. The gov-

8. See, for example, Rosenzweig (1988, table 2). Stiglitz (1974) and Newbery (1977) show that the ability of share contracts to spread risk is redundant only in the special case that three conditions hold at the same time: (i) the labor market provides a riskless wage, w, and full employment, (ii) the productivity of workers paid a wage is the same as that of workers who are paid an output share, and (iii) the farmer can divide his time between working on rented land and working for a wage. Under these conditions, a farmer that spends a share α of his time on land rented at rate r and the rest as a wage earner will earn income $\alpha(q - r) + (1 - \alpha)w$, which spans the space of linear sharecropping contracts.

ernment can be thought of as maximizing its expected value of revenues function, $EW(G)$, subject to the constraint that taxpayers achieve a given level of utility from private goods, while landowners choose a sharecropping contract subject to the constraint that sharecroppers achieve a reservation utility level.

Determination of the Linear Tenancy Contract

Consider the determination of the equilibrium tenancy contract in the medium run, where the landlord is free to adjust the parameters of the contract but not the number of his tenants.[9] For simplicity, assume he has only one tenant and normalize land units so that he owns $T = 1$. To induce the tenant to work on his land, the landlord must offer a contract that yields the tenant his reservation utility level, $\overline{U}$. The tenant has the same utility function as the independent farmer in section I: $U = Eu(y) - v(e)$. The production function also is as in equation 1. With the normalization $T = 1$ and the assumption that $L = 1$, the landlord's production function reduces to $q = \epsilon f(e)$. Define output units so that $E\epsilon = 1$.

The assumption of a fixed number of tenants simplifies the model and is inessential to the results below. However, the assumption of a fixed reservation utility for the tenant, invariant to tax regime, is important and restrictive. In the long run, both the number of tenants per landlord and their "price" U would be endogenous.[10] A fixed tenant reservation utility level is consistent with long-run general equilibrium only if other sectors in the economy can absorb tenants at a fixed wage.

A linear tenancy contract provides payment to the sharecropper as some combination of a share of output, α, and a lump sum, β, yielding tenant after-tax income of:

$$y_w = \alpha(1 - \tau)\epsilon f(e) + \beta$$

Notice some special cases: $\beta = 0$: pure sharecropping; $\beta < 0, \alpha = 1$: lump-sum rent; $\beta > 0, \alpha = 0$: lump-sum wage. So long as $0 < \alpha < 1$, the contract will have a sharecropping element to it.

Landlord income after tax is

$$y_r = (1 - \alpha)(1 - \tau)\epsilon f(e) - \beta - \Gamma$$

The landlord wishes to choose a contract that maximizes his own expected

9. The contract described here is based on Stiglitz (1974, part 2).

10. The general equilibrium problem yields a matrix equation. The variables entering into the demand for tenants are the parameters of the share contract and also e, L, $\overline{U}$, and the Lagrange multiplier on the sharecropper utility constraint perceived by the landlord. The shift in the demand curve for tenants $L(\overline{U})$ induced by changes in the tax regime depends on income effects and output elasticities. This article does not consider the incidence of the land tax, but preliminary work suggests that solutions are quite messy and that in particular cases the tax may be borne partly by the tenant.

utility, denoted $EV(y)$, subject to the constraint of providing a reservation utility level to the sharecropper:

$$\max_{\alpha} \; EV[(1-\alpha)(1-\tau)\epsilon f(e) - \beta - \Gamma] \text{ subject to } U \geq \overline{U} \tag{14}$$

The landlord can observe tenant output, but we make the reasonable assumption that there is at least some dimension of effort that the landlord cannot monitor.

The structure of the landlord's problem in equation 14—his choice of a $(1 - \alpha)$ share in the tenant's output and the tenant's choice of an effort level—is an instance of the same principal-agent relation as in equations 4 and 5, in which the government chose a τ share in farm output and the family chose its effort level. In this light, proposition 1 above can be seen as a straightforward extension of the well-known explanation of sharecropping as a (locally) Pareto-efficient contract between landlord and tenant when risk markets are absent and effort is difficult to monitor (Stiglitz 1974, proposition 11).

Stiglitz's result and proposition 1 can be summarized as follows: if risk markets are insufficiently developed to equate the marginal valuations of risk of landlord and tenant (or government and taxpayer), then the Pareto-efficient linear tenancy contract (or tax regime) must have a share element to it, that is, $0 < \alpha < 1$ (or $0 < \tau < 1$). The next section considers whether this result applies as well to the Pareto-efficient tax regime in the presence of sharecropping.

The Pareto-Efficient Mix of Output and Land Taxes under Sharecropping

Define the tenant's after-tax share in output,

$$\hat{\alpha} \equiv \alpha(1-\tau)$$

and think of the landlord, given some output tax τ, as choosing the variable $\hat{\alpha}$ instead of α. The tenant's effort can then be written as a function of $\hat{\alpha}$.

Government revenues from the representative landlord are

$$G = \tau\epsilon f[e(\hat{\alpha})] + \Gamma$$

The effect of an increase in the output tax rate on the social value of government revenues, $EW(G)$, holding landowner expected utility unchanged, is

$$\left.\frac{dEW(G)}{d\tau}\right|_{\overline{U}} = fE\left[W'\left(\frac{\epsilon - EV'\epsilon}{EV'}\right)\right] + \tau E(W'\epsilon)f'\left(\frac{de}{d\hat{\alpha}}\right)\frac{d\hat{\alpha}}{d\tau} \tag{15}$$

The last term is ambiguous in sign, but vanishes at $\tau = 0$.

Proceeding as we did with equation 7, we can rewrite the first term on the right-hand side of equation 15 in terms of the difference between the social marginal valuation of risk and the landlord's marginal valuation:

$$fEW'\left[\frac{E(W'\epsilon)}{EW'} - \frac{EV'\epsilon}{EV'}\right] > 0 \tag{16}$$

Recall that the landlord will choose to bear some risk (that is, $0 < \hat{\alpha} < 1$ for $\tau < 1$). If the opening of a perfect risk market would not be redundant, then equation 16 holds as before, because of the superior risk-spreading and risk-pooling opportunities available to the government. From this it follows that $dEW(G)/d\tau|_{\bar{V},\ \tau=0} > 0$. This proves that proposition 1 extends to land under sharecropping:

Proposition 1'. If land is farmed by sharecroppers and the opening of a perfect risk market would not be redundant, then the Pareto-efficient tax structure will entail a positive output tax.

Of course, if the landlord is risk neutral, then $E(V'\epsilon)/EV'$ is equal to one, inequality 16 becomes nonpositive, and proposition 1' does not apply. From the perspective of a risk-neutral landlord, the opening of a perfect risk market would be redundant. From the perspective of the tenant, risk markets appear imperfect, but the imperfection in fact lies in moral hazard in the labor relationship between landlord and tenant. If the landlord could costlessly monitor the tenant's work, then a risk-neutral landlord would offer his tenant a fixed wage contract.[11] The landlord would thus bear all income risk. Because he is risk-neutral, the opening of a perfect risk market would be redundant.

IV. Conclusion

This article has argued that there is a misconception in the pure theory of land taxation. In economies in which landowners are unable to obtain complete insurance against production risks—for practical purposes, all developing economies—the classical propositions on the efficiency of land taxes do not hold. Compared with a mix of land and output taxes, a land tax will exacerbate the distortions arising from missing risk markets. The right mix of output and land taxes will yield larger average government revenues (and higher social welfare) than a pure land tax, at a fixed cost in taxpayer utility.

Moreover, output taxes need not stifle economic activity. Under plausible conditions for a rural sector of small landowners, a small output tax and offsetting cut in land taxes will increase effort and, hence, output.

This article has ignored administrative costs. Jonathan Skinner (in this issue) argues that the problem of equitably administering a tax on land value is the most important economic deficiency in the land tax compared with an output tax.

This article also has not considered the incidence on sharecroppers of changes in the mix of land and output taxes. Preliminary work indicates that landlords may not bear the entire burden of the tax; thus, empirical research in this area

11. The intuition is straightforward. With effort costlessly observable, it will be contractually specified. The contract between landlord and tenant then no longer serves as an incentive mechanism but only as a means to attract the tenant. The cheapest way for a risk-neutral landlord to compensate a risk-averse tenant is through a riskless payment—a fixed wage.

would be important. The analysis of output taxes on farms under tenant cultivation also could be extended to other problems involving nested principal-agent relations. The sharecropping model is a prototype for many agency relations where, because of missing markets and costly information, markets clear through contracts based on more than just a price. This suggests that analyses that take account of the nature of contracting in specific markets may overturn the standard results on tax incidence.

Appendix: The Marginal Risk Premium with Respect to Effort

The total risk premium is the maximum amount that the farmer would pay for crop insurance. In the following identity, it appears as c:

$$u\left[T(1-\tau)f\left(\frac{e}{T}\right) - T\Gamma - c\right] = \mathrm{E}u\left[T(1-\tau)\epsilon f\left(\frac{e}{T}\right) - T\Gamma\right]$$

in which u is farmer utility of income, T is the number of acres farmed, f is output per unit of land, e is labor effort, τ is the output tax, Γ is the land tax per acre, and ϵ is a random variable with mean of one.

Differentiating both sides with respect to effort (and letting y denote after-tax income from farm production) yields

$$u'(\mathrm{E}y - c)\left[(1-\tau)f' - \frac{\mathrm{d}c}{\mathrm{d}e}\right] = \mathrm{E}[u'(y)\epsilon](1-\tau)f'$$
$$= (1-\tau)f'[\mathrm{E}u'(y) + \mathrm{cov}(u', \epsilon)]$$

But

(A-1) $$u'(\mathrm{E}y - c) \approx \mathrm{E}u'(y)$$

so that the marginal risk premium with respect to effort can be written as:

(A-2) $$\frac{\mathrm{d}c}{\mathrm{d}e} \approx -(1-\tau)f'\left[\frac{\mathrm{cov}(u', \epsilon)}{\mathrm{E}u'(y)}\right]$$

Equation A-2 establishes that the marginal risk premium with respect to effort is approximately equal to the last term in equation 10 in the text.

Equations A-1 and therefore A-2 hold exactly if marginal utility is a linear function of utility. To see this, let $y(u)$ be the inverse utility function and note that by construction $u[y(u)]$ (the random utility obtained when income is risky) is a mean utility preserving spread of $u(\mathrm{E}y - c)$ (the utility obtained at the riskless income $\mathrm{E}y - c$). The condition that marginal utility is linear in utility is identical to the condition that preferences are characterized by constant absolute risk aversion, because

$$\frac{\mathrm{d}^2}{\mathrm{d}u^2}\{u'[y(u)]\} = \frac{\mathrm{d}}{\mathrm{d}u}\frac{u''}{u'} = -\frac{\mathrm{d}}{\mathrm{d}u}A[y(u)]$$
$$= \frac{-A'}{u'} \gtreqless 0 \Leftrightarrow A'(y) \lesseqgtr 0$$

Hence equation A-2 holds exactly if the farmer's degree of absolute risk aversion is independent of his income.

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If Agricultural Land Taxation Is So Efficient, Why Is It So Rarely Used?

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The land tax enjoys a distinguished pedigree in the theoretical literature on tax efficiency, yet it is rarely used as a serious revenue source in rural areas of developing countries. This article considers three drawbacks of the land tax relative to taxes on exports or marketed output: (1) capitalization effects of the land tax impose a large burden on the current generation, (2) land taxation increases the riskiness of net farmer income, and (3) administration of the land tax entails costly informational requirements. This article demonstrates that only the second and third drawbacks are valid economic arguments against the land tax. Simulations based on an economic model of farm behavior suggest that farmers may still prefer a land tax to an export tax despite the increased uncertainty of their after-tax income. Administrative costs are therefore the best explanation of the weak link between the theoretical and practical aspects of land taxation.

Liberalized agricultural export policies, realigned exchange rates, and a reduced role for marketing authorities have created a favorable environment for agricultural growth in many developing economies. But these policies are not without cost; countries lose an important source of revenue from the agricultural sector. Given the lack of foreign credit and strained capability of other taxes, some countries are seeking alternative methods for taxing income from the agricultural sector.

One prospect for raising revenue is a tax based on land area or quality. The land tax has a great potential for revenue collection since land is readily observable and in fixed supply. The land tax causes no distortion of output prices; farmers are encouraged to produce at high levels because they receive the full price for their crops. Furthermore, the land tax has enjoyed a distinguished pedigree in the theoretical literature since Ricardo. For example, Newbery (1987, p. 381) acknowledges that the efficiency of the land tax is "not in doubt" while Lewis (1984, p. 167) writes that "it is the likely impact of the land tax in increasing farm marketing that explains its appeal to many economists."

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It is therefore paradoxical that the use of land taxation has eroded so rapidly during the past several decades. In 1940, agricultural land taxation as a fraction of central government tax revenue was 23 percent in Egypt, 19 percent in India (which then included what are now Bangladesh and Pakistan), and 5 percent in Chile (Bird 1974). By 1987, no country in this group collected more than 1 percent of central government revenue from agricultural land taxation, and few countries relied on land taxation for more than 3 percent of government revenue (Strasma and others 1987).[1] In 1959, Wald concluded that when governments have had a choice, they have been inclined to favor a strengthening of income or export taxes, or an extension of indirect taxes, over an increase in land taxes (p. 63).

This article examines three potential explanations for why the agricultural land tax is so rarely used for raising more than a trivial fraction of central government revenue. The first is that current landowners object to land taxation because they bear more than 100 percent of the tax burden. Any increase in land taxation leads to a large capital loss in land value because the prospect of future tax payments depresses current land prices. This article shows that while the capitalization effect of land taxation is substantial, the prospect of future export or commodity taxation similarly depresses current land prices. Replacing an export tax with a land tax could even *increase* land prices. Hence the capitalization effect is not a good explanation for why land taxation has declined in use.

The second drawback of the land tax is that farmers suffer from the undesirable risk characteristics of a land tax in the presence of imperfect insurance markets, as shown by Hoff (this issue). The land tax must be paid each year regardless of the success or price of the crop, while commodity taxes pool risk by taxing only the value of marketed output. This article makes some illustrative calculations of welfare under a land tax and output tax that show that a land tax generally dominates an output tax when the output tax rate is high, even in the presence of substantial consumption uncertainty. Furthermore, as Hoff has demonstrated, combining both taxes is Pareto efficient relative to either tax alone. In Uruguay, for example, the government uses a land tax to raise revenue from cattle ranchers, but it still retains the export tax to stabilize the domestic price for producers and especially urban consumers (Jarvis and Medero 1988).

The third reason why land taxation may be little used to collect revenue lies in administrative factors. Unlike the commodity or export tax, which is based on readily observable measures of output, the land tax is based on site value, market value, or net income, measures which in rural areas with sparse land markets are often difficult to observe. Landowners have every incentive to un-

1. The time-series pattern of other countries not mentioned in the text has also exhibited a strong downward secular trend in land taxation (Bird 1974, pp. 34–35, and Skinner 1990). One problem with the statistics on land taxation is that the International Monetary Fund statistics used by Strasma and others do not report local government land tax revenue for many countries. Local governments appear to have been more successful in maintaining land taxes. The contrast between central and local government agricultural tax policy is discussed briefly at the end of this article.

derstate the value of their taxable land. The administrative costs of ensuring compliance may thus offset the efficiency gains of the land tax.[2] Using a model developed by Stern (1982), I show that if a society has an aversion to inequality, a nondistortionary land tax based imperfectly on land value can make society worse off than an export tax administered without error. Problems of compliance and land valuation are the weakest link between the theoretical superiority of the land tax and its practical incarnation.[3]

While there is a wide gap between the positive analysis presented below and the normative process by which governments make choices, the implication of this article is that neither capitalization nor risk factors are good explanations for why governments choose export or commodity taxes over the land tax. Instead, the difficulty of administering the land tax may be the best explanation for its gradual erosion.

The next section presents a general model of an economy with agricultural and urban sectors. Each section that follows addresses the question of why land taxation is a declining source of revenue: section II examines capitalization effects, section III the increased risk imposed on farmers by land taxation, and section IV the problem of administration. Section V concludes with some reflections on the political dimension of land taxation and the distinction between central and local government revenue sources.

I. Theoretical Model of Land Ownership and Taxation

The organization of farm production and the type of land taxation vary widely among countries, so one must be careful about defining a single econmic model.[4] In Asian countries such as Bangladesh, India, and Indonesia, the land tax falls on small-scale farmers who often consume a large fraction of their own production. In several Latin American countries, land taxation is used to tax the vast estates that may grow crops (or raise cattle) only for the export trade. Land taxation is far less prevalent in African countries without a tradition of individual property rights in land.

The type of land taxation also differs across countries. In some cases, land taxes are similar to imputed income taxes; the tax is based on the market value of the land, or the annualized net profits from land. In other countries, an attempt is made to base the tax on land quality, such as soil quality and distance to the nearest paved road. A third method is to simply use land area as the base with no attempt to distinguish quality. In the model that follows, a proportional

2. Slemrod (1990) emphasizes the distinction between optimal taxation and optimal tax systems. Land taxation is an optimal tax, but may not be an optimal tax system once administrative expenses are accounted for.

3. Bird (1974) reached a similar conclusion in his international comparisons of agricultural land tax administration.

4. See Bird (1974) and Strasma and others (1987) for more detailed discussion of different land tax systems.

tax based on quality-adjusted land area is assumed, although costly assessment may be required to determine the land quality.

The Agricultural Sector

The agricultural sector produces a tradable commodity x subject to an export tax τ at the border. The domestic price p depends on the export tax and on the world price p^*, that is assumed constant. Neglecting transportation costs, one can write

$$p_j = p_j^*(1 - \tau)$$

where j denotes the time period. Define the units of the traded good so that p^* is equal to 1 in terms of the numeraire nontraded good. The assumption of $p^* = 1$ will be maintained throughout the analysis.

The product function of the tradable good for each farmer i in period j is given by

$$x_{ij} = F(L_{ij}, T_{ij}, \epsilon_{ij}) \tag{1}$$

where F is assumed to have constant returns to scale, L_{ij} is the farmer's labor supply, T_{ij} is quantity of land, and ϵ_{ij} is a multiplicative random variable reflecting weather conditions and other factors. Let F_{Lj} and F_{Tj} be the marginal product of labor and land in period j. Assume that workers are paid their marginal product $w_j = p_j F_{Lj}$ and the (spot) annual rental value of land is $p_j F_{Tj}$.

In the derivations that follow, assume competitive markets and a representative farmer subject to uniform random shocks ($\epsilon_{ij} = \epsilon_j$). Hence there is an equivalence between market outcomes and individual choices, so that aggregate measures of output or revenue are calculated by multiplying individual quantities by the number of farmers (this assumption is relaxed in section IV).

Assume that individuals in the agricultural sector consume only the tradable good x, the numeraire good z, and leisure l, and that each individual lives for two periods. Expected lifetime utility for an individual in the agricultural sector (indicated by a superscript a) is written

$$EU^a = U(x_1^a, z_1^a, l_1) + (1 + \delta)^{-1}E[U(x_2^a, z_2^a, l_2)] \tag{2}$$

where the individual subscript i is suppressed, δ is the time preference rate, and E is the expectations operator conditional on information in period 1.

At any given point in time, there are two generations alive. The younger generation provides a fraction L_j of time for work (equal to $1 - l_j$, or the fraction not spent in leisure) for which they receive a wage. At the end of the first period, they choose consumption, and use the remaining income to purchase assets for their elderly years in the second period. Hence only the older generation owns land or capital.

One can write the farmer's first-period full income as being the wage rate, w, times the full endowment of time, 1.0. The farmer then "buys" leisure (at the

wage w), consumes the two commodities x and z, and saves the remainder as S. That is, letting m_1 be expenditures in period 1,

$$w_1 = m_1 + S = p_1 x_1^a + z_1^a + l_1 w_1 + S. \tag{3}$$

The budget constraint in the second period is more complicated since the elderly generation splits their life cycle saving between land and traditional capital. Furthermore, there may be unexpected capital gains or losses when land is sold at the end of period 2 to finance consumption. Saving S is distributed between purchases from previous generations of land at the end of period one, $Q_1 T$, where Q_j is the price of one unit of land in period j, plus investments in traditional assests K which pay a fixed, untaxed rate of return r.[5] Total income in the second period consists of income flows net of the land tax Γ plus the sale of land and capital stocks;

$$m_2 = w_2 + (Q_2 + p_2 F_{T2} - \Gamma)T + (1 + r)K. \tag{4}$$

Since total saving $S = K + Q_1 T$, one can also express equation 4 as

$$m_2 = w_2 + (Q_2 + p_2 F_{T2} - \Gamma)T + (1 + r)(S - Q_1 T) \tag{4'}$$

The arbitrage condition for the price of land holds that in a world of certainty and in steady-state equilibrium in which $Q_j = Q_{j+1}$, one dollar invested in land should yield the same net return as the same dollar in capital K;

$$pF_{T_j} - \Gamma = rQ_j \tag{5}$$

Finally, it will be easier for derivations in later sections to express the utility function in its indirect form as a function of prices and income. Equation 2 can therefore be rewritten in terms of p_j, the price of leisure w_j, and full income m_j;

$$EU^a = V^a(p_1, w_1, m_1) + (1 + \delta)^{-1} E V^a(p_2, w_2, m_2). \tag{6}$$

To this point, only the agricultural sector has been discussed. Because export tax policy also affects the domestic price of the traded good, the welfare implications for consumers in the urban sector must also be considered.

The Urban Sector

Individuals in the urban sector purchase the tradable good x from the rural sector. Holding other prices constant, the urban indirect utility function is written solely as a function is written solely as a function of the domestic price of x;

$$\begin{aligned} U^b &= U^b(x_1^b, z_1^b) + (1 + \delta)^{-1} U^b(x_2^b, z_2^b) \\ &= V^b(p_1) + (1 + \delta)^{-1} V^b(p_2) \end{aligned} \tag{7}$$

where b denotes the urban sector and V^b is the indirect utility function. The implicit assumption in equation 7 is that policies in the agricultural sector do not

5. Adding a capital income tax on rK would complicate the model without changing the basic results.

affect income in the urban sector, but only affect the domestic price of x: the urban sector consumes imported goods purchased with foreign exchange earned from the agricultural exported goods. (A more general treatment of the urban sector would also account for changes in import demand as a consequence of tax policy shifts.)

Taxation and Revenue

Because the agricultural production function assumes constant returns to scale, there are no pure profits. Hence the export tax is equivalent to an equal-rate factor tax on labor and land at rate τ. For a given tax regime (τ, Γ), the present value of aggregate tax revenue can be expressed as

$$R = \tau F_{L1} L_1 + \frac{\tau F_{L2} L_2 + (\tau F_{T2} + \Gamma)T}{1 + r} - \tau(X^a + X^b) \tag{8}$$

where X^a and X^b are the present value of aggregate expenditures on x goods by the rural and urban consumers (for example, $X^a = x_1^a + (1 + r)^{-1} x_2^a$). Revenue here is defined in terms of the present value for a given generation. This is to preserve comparability with shifts in social welfare or in utility, which are also measured on a lifetime basis.

Making Urban-Rural Welfare Comparisons

Replacing an export tax with a revenue-neutral land tax will affect not just the production incentives of farmers, but also the prices paid by urban consumers for the tradable good x. Furthermore, replacing an export or commodity tax with land taxation may affect different farmers differently depending on their landholdings and productivity. To provide a means of quantifying these comparisons between urban and rural individuals (or among rural farmers), the social welfare function is written $\Omega(U^{a1}, U^{a2}, \ldots, U^b)$ where U^{ak} reflects the utility of farmers with different landholdings k.

Even in its most general form, the model is quite simple and ignores rural-urban migration (for example, Heady and Mitra 1987), the impact of taxation on urban land and income, and variation in international exchange rates. Nevertheless, the general model can be used in the subsequent sections to analyze the impact of land taxation on intergenerational equity, risk patterns, and tax administration.

II. LAND TAXATION AND CAPITALIZATION EFFECTS

What is the relative benefit of switching from an export tax to a land tax in a model of perfect certainty and identical farmers? The answer to this question must be considered in short-run and long-run frameworks because the tax affects current generations much differently from future generations.

To simplify the general model in section I, assume the individual retires in the

second period ($l_2 = 1$) and the production function is linear; $F = F_L L_1 + F_T T$ where F_L and F_T are constants.[6] The strategy used below for determining whether the land tax should be increased or reduced is based on the marginal shadow-price analysis in Ahmed and Stern (1984). First, one measures the (negative) impact on social welfare of raising the land tax by a sufficient amount to increase revenue by one rupee. Then one evaluates the same measure for the export tax. These two shadow-price measures are defined to be

$$(9) \qquad \lambda_\tau = \frac{-\partial\Omega/\partial\tau}{\partial R/\partial\tau} \quad \text{and} \quad \lambda_\Gamma = \frac{-\partial\Omega/\partial\Gamma}{\partial R/\partial\Gamma}.$$

A welfare-improving reform occurs when an increase in the tax with *lowest* social cost is coupled with a revenue-neutral decline in the tax with highest social cost. For example, when $\lambda_\Gamma < \lambda_\tau$, a shift in taxes from the export tax toward land taxation is efficient; when the two measures are equal, the tax system is at a local optimum. Note that this procedure provides only the direction, but not the magnitude, of welfare-improving change in the tax system.[7]

A shift in the land tax will have a different impact on current generations than on future generations. The short run is defined as the period during which all land is held by a given older generation. The market price of land, Q_2, must fall by enough to restore equality between the after-tax yield of land and that on capital assets. From the arbitrage condition 5, $dQ_2/d\Gamma = -1/r$. That is, a one-unit increase in the land tax Γ will impose a capital loss on the old generation of $1/r$ per unit of T held.[8]

Expressing U^a and U^b in terms of their indirect utility functions and using Roy's identity holding Q_1 constant implies that the short-run (SR) impact of the land tax on social welfare is

$$(10) \qquad \lambda_\Gamma(\text{SR}) = \left(\frac{\partial\Omega}{\partial U^a}\right)\frac{v_2^a(1+\delta)^{-1}\left(\frac{1+r}{r}\right)}{(1+r)^{-1}}.$$

With appropriate normalization, equation 10 can be rearranged to show that[9]

$$(10') \qquad \lambda_\Gamma(\text{SR}) = \frac{1+r}{r} > 1.$$

6. This second assumption is maintained because the young provide labor and the old own land. When the production function is nonlinear, shifts in, say, labor supply by the young affect the return to land for the old. This "pecuniary externality" complicates the analysis and is therefore ruled out by assumption.

7. One cannot determine the optimal tax rates using this procedure because local, not global, parameters are used in the marginal assessment.

8. The capitalization effect derived above depends crucially on the assumption that the marginal product of land is unaffected by the supply of capital and that the interest rate is held constant. If the land tax encourages capital accumulation, and the marginal product of land is thereby enhanced, the capitalization effects will be less than $1/r$ (Chamley and Wright 1987).

9. Equation 10′ is derived by using $dQ_2/d\Gamma = -1/r$ from the arbitrage condition, $\partial V_2^a/\partial m_2 = [(1+\delta)/(1+r)](\partial V^{a1}/\partial m_1)$ from the Euler equation, and normalizing $(\partial\Omega/\partial U_a)(\partial V_1^a/\partial m_1] = 1$.

That is, holding the interest rate constant, the landowner is worse off by $(1 + r)/r$ for every increase in tax revenue of \$1.[10] For example, suppose the interest rate were 6 percent; a \$1 revenue increase from the land tax would make individuals currently alive worse off by \$17.67 (\$1 paid in tax plus \$1/0.06 lost in property value). Even if one views r as reflecting the accumulated return over a twenty-year span of time (so that the r used in 10′ is written as $1.06^{20} - 1$), the cost to existing landowners is \$1.45 per \$1 in revenue collected. It is no surprise that in this simplified model, the landowners would object quite strenuously to a land tax.[11]

While the short-run impact of the land tax is very costly to the current generation of landowners, the long-run (LR) characteristics of the land tax when both Q_1 and Q_2 adjust to the new tax regime are highly favorable to future landowners. Future generations will buy and sell land at a price that is reduced by the amount $1/r$ per increase in Γ. The marginal impact of the land tax on social welfare in the long run is given by

$$(11) \qquad \lambda_\Gamma(LR) = \frac{V_I^2(1 + \delta)^{-1}[\partial Q_2/\partial\Gamma - 1 - (1 + r)\partial Q_1/\partial\Gamma]}{T(1 + r)^{-1}} = 0.$$

In the long run, the land tax is even better than a lump sum tax; future generations *bear no burden at all*, but gain revenue at the expense of the landowners alive at the time of the tax.[12] In sum, a life cycle model implies that land taxation is never "lump sum" in that the revenue collection is equal to the equivalent monetary loss of the individual. Current generations bear more than the burden of the tax, (in the ratio $(1 + r)/r$, and future generations bear no burden. Only when individuals live forever and never sell their land (or when they have strong Ricardian bequest functions) is the tax lump-sum in the sense of reducing lifetime wealth by the present value of the tax revenue.

Can the capitalization of the land tax explain the preference in most developing countries for export taxes over land taxes? The answer is no. As is shown below, export taxes have similar capitalization effects that can be larger in magnitude than those for land taxation.

Once again, the short-run impact of the export tax on current generations differs from the long-run impact. The older generation suffers a capital loss when the export tax is increased; from the arbitrage condition 5, $dQ_2/d\tau =$

10. As discussed in note 8, in an overlapping generations model with endogenous capital, a land tax will generally increase the stock of reproducible capital, reduce the interest rate, and hence cushion the capitalization effects (Chamley and Wright 1987).

11. The assumption of perfect capital markets is a strong one, especially for developing countries. But capitalization effects hold even with imperfect capital markets. However, this model neglects the important role of land equity as collateral in rural credit markets (Feder and Feeny, this issue).

12. See Feldstein (1977) and Chamley and Wright (1987) for a detailed analysis of the impact of land taxation on capital accumulation.

$-F_T/r$. The total change in income of this older transition generation is given by[13]

$$\frac{dm_2(\text{SR})}{d\tau} = -F_T\left(\frac{1+r}{r}\right)T. \tag{12}$$

Additional effects of the export tax are (1) wage rates fall, so some of the burden is borne by the younger generation in the rural areas, and (2) the domestic price of the tradable x declines, making urban consumers of x better off (see Trapido 1988). The overall impact on social welfare is

$$\lambda_\tau(\text{SR}) = \left[\frac{F_T T(1+r)/r - (X_2^a + \Psi_b x_2^b)}{F_T T - X_2 - \tau(\partial X_2/\partial p_2)}\right] \tag{13}$$

where $X_2 = x_2^a + x_2^b$ and

$$\Psi_b = \frac{\partial \Omega}{\partial U_b}\,\frac{\partial U_b}{\partial m_b}.$$

The parameter Ψ_b summarizes the weight that the social welfare function places on marginal consumption of x by urban consumers relative to the benchmark of agricultural consumers. For example, if urban consumers are wealthier than rural consumers and society values equality, then $\Psi_b < 1$.

The stylized economy jumps directly to a new steady state, so the welfare changes of those who are young during the transition can be described by the long-run analysis. Once again expressing the marginal social cost of the export tax as the ratio of the change in social welfare to the change in revenue,

$$\lambda_\tau(\text{LR}) = \frac{F_L L_1 - (X^a + \Psi_b X^b)}{F_l L_1 + \dfrac{F_T T}{1+r} - X - \tau\left(F_L \partial L_1/\partial w_1 + \dfrac{\partial X}{\partial p}\right)} \tag{14}$$

where $X = X^a + X^b$, or the total present value of combined urban and rural traded goods consumption. The numerator describes the (negative) shift in money income; the rural sector is worse off because of lower real wages $F_L L_1$, but that loss is cushioned by the fall in prices for domestic consumption of x. The denominator reflects the present value of the change in revenue as a consequence of increasing τ.

Suppose that the urban consumers are weighted equally in the social welfare function with agricultural consumers (so that $\Psi_b = 1$) and that the present value of *total* domestic consumption of x exceeds gross first-period earnings $F_L L_1$. Then $\lambda_\tau(\text{LR}) < 0$; the export tax makes future generations better off even if the revenue is simply tossed into the ocean. Future generations would therefore prefer an export tax even to a nondistortional land tax. But this does not mean that the export tax is more efficient than the land tax. Long-run benefits of an

13. Note that time subscripts can be dropped from F_T and F_L because the production function is linear.

export tax come at the expense of short-term capital losses suffered by the transitional generation. Summed over all generations, land taxation is more efficient than export taxation.[14]

Finally, the relative impact of land and export taxation on land values can be derived. The effect of a one-rupee increase in land tax revenue on the price of land is

$$-\frac{\partial Q_2/\partial \Gamma}{\partial R/\partial \Gamma}\,(\mathrm{SR}) = \frac{1}{r} \tag{15}$$

while the impact on land prices per rupee paid in export taxes by the transitional generation is

$$-\frac{\partial Q_2/\partial \tau}{\partial R/\partial \tau}\,(\mathrm{SR}) = \frac{F_T/r}{F_T - X - \tau(\partial X_2/\partial p_2)}, \tag{16}$$

which will generally be greater than $1/r$. In part this strong result is a consequence of assuming that the transitional generation does not work, so the export tax affects only its income from land. In general, the outcome is ambiguous.

To summarize, the argument that taxpayers object to the land tax because they thereby suffer capitalization effects is probably not a good explanation for why the land tax is rarely used. Export taxes also depress land prices, and it is further shown that replacing an export tax with an equal-revenue land tax could increase land prices.

III. The Land Tax Imposes More Risk on Farmers

To this point, the model has been cast in a model of perfect certainty. One of the major differences between land taxation and commodity taxation is that commodity taxation reduces risk borne by farmers. Hoff (this issue) has demonstrated a stronger result: any Pareto-efficient tax system will involve at least partial risk pooling using commodity or export taxation.

Treating uncertainty in an overlapping generation model can give a somewhat misleading picture of the effect of tax policy. In the long run, land prices adjust so that the rate of return on land—corrected for differences in risk—is the same as the return on other investments, so that future farmers do not bear the burden of past tax policy choices. I therefore focus on economic behavior in the second period for those individuals who have already purchased their land, thereby collapsing the model to a traditional one-period framework. Assume further that farmers consume only current income from wage earnings and land investments.

The question to be addressed in this section is: what is the magnitude of

14. This can be shown by taking the present value of λ_τ and λ_Γ across generations. The ratio of the loss in social welfare to revenue collected across all generations is 1.0 for the land tax, and assuming that $\Psi_b = 1$ (to abstract from redistributional issues), this same ratio always exceeds one for the export tax.

uncertainty necessary to find the land tax deficient in comparison with the export tax? To answer this question, one must specify an exact form for the second-period utility function;

$$EU = \frac{E(x^{\phi_1} z^{\phi_2} l^{\phi_3})}{\phi_1 + \phi_2 + \phi_3} \tag{17}$$

subject to the budget constraint

$$px + z + wl = m \equiv w + (pF_{\Gamma} - \Gamma)T \tag{18}$$

where the agricultural and time subscripts can be suppressed to simplify the equations. The production function is

$$F = T^{1-g}(1 - l)^{g}(1 + \epsilon) \tag{19}$$

where ϵ is the random variable, such as rain, reflecting unexpected differences in productivity.[15]

The model is straightforward to solve using iterative methods; the solution technique is described in the appendix. Initially optimal labor and commodity choices are determined given a particular level of export taxation τ and degree of riskiness. Then the export tax is removed, and a new land tax Γ is imposed to the point where the indirect expected utility function is equal to the benchmark case with export taxation. That is, Γ^* is determined such that

$$EV[1 - \tau, m(\tau, 0; \epsilon)] = EV[1, m(0, \Gamma^*; \epsilon)]. \tag{20}$$

The measure of the efficiency gain or loss is the difference between revenue raised under the land tax, $\Gamma^* T$, versus revenue raised under the export tax. The difference is the compensating variation with utility held at its original value.

I assume a binomial distribution with $\epsilon = +\omega$ or $-\omega$, each with probability 0.5. The coefficient of variation, or the ratio of the standard deviation to average output, is approximately ω. Other parameters are $g = 0.5$ and $T = 1$. Recall that switching from export taxation to land taxation will harm the urban sector because the domestic price p will rise from $(1 - \tau)$ to 1. Land tax revenue is therefore defined to be revenue net of the amount necessary to compensate urban residents for the higher price of x (equivalently, one can assume that all marketed production of x is exported). Finally, the utility function parameters are $\phi_j = 0.1, j = 1, 2, 3$, yielding a measure of constant relative risk aversion equal to 0.7 (equal to $1 - \Sigma\phi_j$), well within the range of 0.3 to 1.7 estimated for the majority of Indian rice farmers (Binswanger 1980).

Results are shown in table 1. The numbers shown are a measure of compensating variation as a fraction of initial full income m. The value is positive if the land tax is more efficient and negative if the land tax is less efficient. For example, when there is no uncertainty, the efficiency gain of replacing a 50

15. I assume labor supply is chosen after ϵ is revealed to the farmer. Allowing l to be chosen before ϵ is revealed will increase the impact of uncertainty on production decisions.

Table 1. *Welfare Effects of Replacing an Export Tax with a Land Tax*

Percentage of income[a]	*Coefficient of variation* 0.0	0.1	0.2	0.4
		Relative risk aversion = 0.7		
Export tax				
10	0.12	0.09	0.00	−0.64
30	1.61	1.64	1.33	−0.96
50	7.40	7.81	7.40	2.43
		Relative risk aversion = 2.50		
Export tax				
10	0.12	0.05	−0.22	−1.57
30	1.61	1.42	0.38	−4.91
50	7.40	7.18	4.79	−7.84
		Relative risk aversion = 0.4		
Export tax				
10	0.12	0.11	0.03	−0.44
30	1.61	1.68	1.51	−0.08
50	7.40	7.92	7.88	4.86

a. Expressed as a percentage of initial full income *m*. Positive value denotes welfare *gain* from shift to land tax, negative value denotes welfare *loss*.

percent export tax with a land tax is 7.41 percent of total income, or 27.6 percent of revenue collected. As the uncertainty in production becomes more pronounced, the export tax can dominate land taxation.[16] Hoff's theoretical results are confirmed for low levels of export taxation. A 10 percent export tax can benefit farmers who face uncertainty; even when the coefficient of variation is 0.2, the export tax is as efficient as the land tax. But for higher export tax rates, the land tax is more efficient even for large degrees of uncertainty.

Table 1 also reports results for alternative parameters of the utility function when ϕ_j is scaled down to −0.5 (leading to an Arrow-Pratt measure of 2.50), and up to $\phi_j = 0.2$ (an Arrow-Pratt measure of 0.4). The benefits of an export tax are greater for those with greater aversion to risk, but the qualitative conclusions are similar.

It is likely that these calculations overstate the benefits of the reduced risk provided by the export tax. The absence of credit markets in rural areas does not mean that farmers are forced to consume their current net income, as is assumed in the model above. While farmers may find it difficult to borrow, they are not prevented from saving. As Deaton (1989) has demonstrated, farmers can insure against part of their income risk with precautionary saving even in the absence of credit markets.

Hoff (this issue) demonstrated that a combination of a land tax to raise revenue and an export tax to stabilize income Pareto dominates either tax in

16. These calculations do not account for the increased risk assumed by the government under an export tax. Also, it may appear that for some parameters, the efficiency gain of a land tax *increases* when the coefficient of variation rises from 0.0 to 0.1. The puzzle is resolved by noting that the absolute gain from land taxation is less when the coefficient of variation is 0.1, but *m* declines by even more, causing the ratio to rise.

solation. There is an optimal tradeoff between the insurance benefits of an ·xport tax and the improved incentives of a land tax. If a nondistorting insur- ınce program were possible that reduced ω to zero, it would yield the efficiency ;ains shown in the first column of table 1.

In Uruguay, cattle ranchers face substantial uncertainty from international luctuations in beef prices. Jarvis and Medero (1988) have argued that the entral government collects revenue from the land tax and uses variable export ax rates to dampen the international price oscillations as well as to shield urban ›eef consumers from domestic price swings. Thus the government in Uruguay ıses both export and land taxation to raise revenue and reduce risk.

IV. The Land Tax Entails Greater Administrative and Evasion Costs

In theory the problem of collecting land taxes is straightforward: conduct a adastral survey that assesses the market or site value of each plot of land, and end a tax bill to each owner. In practice, cadastral surveys are expensive and ime consuming, tax offices are short on assessors, assessments are eroded by nflation, and courts are often swamped by appeals from irate landowners.[17] As lichard Bird's classic 1974 book on land taxation argues: "the administrative onstraint on effective land tax administration is so severe in most developing ountries today that virtually all the more refined fiscal devices beloved of heorists can and should be discarded for this reason alone. Not only will they ıot be well administered; they will in all likelihood be so poorly administered as o produce neither equity, efficiency, nor revenue (p. 223)." The careful survey ›y Strasma and others (1987) provides recent documentation of the difficulties nherent in the effective administration of the tax.

The purpose of this section is to provide a model of why countries have had a nuch harder time administering the land tax than other types of tax. The strong ncentive to misrepresent the true value of one's land leaves the government with ı difficult choice of either allowing widespread evasion or spending valuable esources to enforce compliance. For example, the administrative cost of the and development tax in Bangladesh during the mid-1980s was more than half he tax revenue. These administrative costs must be reckoned as real resource :osts—just like the traditional Harberger efficiency cost of distortionary taxa- ion.[18] Few commodity or trade taxes entail efficiency costs in excess of 50 ›ercent of tax revenue.

Once again the general model from section I is specialized to address the issue ıt hand. As in section III, I abstract from capitalization effects, and focus instead ›n second-period production decisions of landowners. It is assumed that all life

17. Strasma and others (1987) suggested that the administrative capability of the government is ›verwhelmed if 5 percent of landowners appeal their tax assessment.

18. Of course, administrative costs of land taxation in Bangladesh also yield social benefits such as naintaining records of land ownership.

cycle capital is invested in land. Since the primary focus here is on equity and utility *among* farmers of different types, I assume that all marketed sales of x bypass the urban sector and are sold in export markets.

Assume there are two types of people with identical farm plot sizes. Normalize the population size of each group at unity. Person n, the benchmark (normal) individual, supplies $L_n = 1 - l_n$ units of labor and owns T effective units of land. The high-quality farmer (person h) is endowed with $\xi > 1$ units of effective labor (that is, he is a more productive worker) and βT effective units of land, with $\beta > 1$. Utility for each person is given by $V_i = E\,V_2(p, w_i, m_i)$, where the implicit wage w_i may differ across types. Expected full income is written

$$(21) \qquad \begin{aligned} Em_n &= w_n + \{pF_{Tn} - [1 + \pi_2(\beta - 1)]\Gamma\}T \\ Em_h &= w_h + \{pF_{Th} - [\beta - \pi_1(\beta - 1)]\Gamma\}T. \end{aligned}$$

With probability π_1, the administrative agency incorrectly assesses the high-quality land as normal land, and with probability π_2 normal land is incorrectly assessed as high-quality land (see Stern 1982).

The probability π_1 (or, in a group of many farmers, the fraction who are misassessed) is endogenously determined as an optimal response by each individual to the tax premium on high-quality land $\Gamma(\beta - 1)$ and administrative effort, measured as administrative costs per unit of land c; $\pi_1 = \pi_1[c, \Gamma(\beta - 1)]$, with $\pi_{11} < 0$ and $\pi_{12} > 0$, with the second subscript denoting the derivative with respect to the ith argument.[19] Similarly, the higher the administrative effort or cost c, the less likely that low-quality land is misassessed; $\pi_{21} < 0$. Noting that total physical land area is $2T$, revenue net of administrative costs is

$$(22) \qquad R = \tau(x_n^* + x_h^*) + [1 + \beta + (\pi_2 - \pi_1)(\beta - 1)T\Gamma - 2cT$$

where x_i^* is net marketed sales of the tradable good.

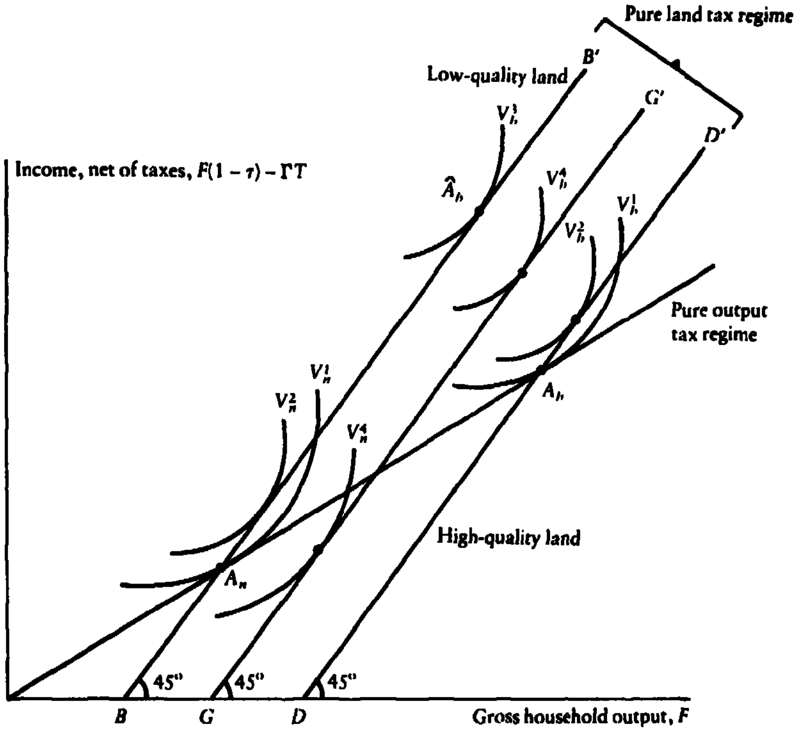
Assume no administrative costs of the export tax. This is an obvious simplification; the point is that the export tax is administered at a central shipping area or airport, and typically entails low costs of administration. Smuggling can be discouraged by imposing large penalties for avoiding export taxes, even if not every smuggler can be caught. By contrast, it is difficult to impose large penalties for underreporting land quality, since reasonable people may differ over the "true" value of land (Skinner 1990).

Figure 1 plots after-tax income against original income. Assume that all production of the x good is marketed and not consumed so the after-tax income line is straight.[20] Given a pure output tax regime, the two types will reveal their

19. The endogenous functions π_i can be derived using the standard model of expected evasion in which the individual's decision to evade depends on the probability of an "audit" or assessment (implicitly a function of c), the gains from evading $[\Gamma(\beta - 1)]$, and the penalty of being caught (see Allingham and Sandmo 1972). One problem with this type of model is that it would predict that everyone should evade, since the penalties are rarely large enough to justify reporting land quality truthfully (Skinner and Slemrod 1985).

20. This assumption need not be maintained for the analytical derivations below.

Figure 1. *Incidence of a Pure Output Tax and a Pure Land Tax on Two Types of Farmers*



Note: h = high-quality land; n = low-quality land; Γ = quality-adjusted per acre land tax; τ = output tax rate; V_i = indirect expected utility of farmer i; BB' = after-tax budget line, low-quality land; DD' = after-tax budget line, high-quality land; GG' = after-tax budget line, simple acreage tax (both farmers have same acreage).

productive capacity through their marketed output and locate on a "separating equilibrium" (see for example Stiglitz 1987 or Stern 1982): person n at A_n and person h at A_h. Tax authorities need only collect the tax per unit of output, rather than determine who is a high- or low-ability farmer.

If tax authorities can identify which land is the high-quality land, a more efficient tax on land area can be assessed. Lines BB' and DD' reflect the after-tax budget lines of the low-quality and high-quality types, respectively, under a pure land tax regime yielding the same revenue as the output tax regime did. Each farmer will be better off at V_n^2 and V_h^2. The problem, however, is the self-selection criterion—unlike the commodity tax regime, type h farmers will be better off to represent their land value as low-quality, and attain utility level V_h^3.

The model presented above reflects this tendency toward a pooling equilibrium; unless real costs are expended to forcibly separate high-quality from low-quality landowners, everyone will represent his land as low-quality.

Of course, one option would be to base the tax only on land acreage. In the model above, each farmer owns the same acreage, so each would pay the same tax and face budget line GG'. Note that while this tax is perfectly efficient, it is less equitable, since the utility of type n farmers drops to V_n^4, while the type h farmer's utility rises to V_h^4. As the diagram is drawn, the normal farmer's utility declines relative to utility under the export tax.

Is it therefore better for the government to spend more money on administration to ensure that type h owners declare their land truthfully? Not necessarily, since administration costs reduce net revenue (also see Kaplow 1989). In general, to raise more revenue from the land tax the government is faced with two choices; either spend more on administration or raise the rates. In the derivations below, it is shown that neither option may be socially efficient at the margin relative to an export tax.

Since we are concerned here only with different types of farmers, let $\Omega = \Omega(V_n, V_h, \cdot)$, with $\Psi_i = (\partial\Omega/\partial V_i)(\partial V_i/\partial m_i)$, $i = n, h$, and Ψ_n normalized to 1 (so that for a concave social welfare function, $\Psi_h < 1$). Then the marginal social cost of raising \$1 in revenue from an export tax can be derived using Roy's identity;

$$\lambda'_\tau = \frac{-\partial\Omega}{\partial\tau}\Big/\frac{\partial R}{\partial\tau} = \frac{x_n^* + \Psi_h x_h^*}{x_n^* + x_h^* + \tau\left(\dfrac{\partial x_n^*}{\partial\tau} + \dfrac{\partial x_h^*}{\partial\tau}\right)}. \tag{23}$$

Once again, the numerator is weighted by the relative value of income in the social welfare function.

Another option available to the tax administrators is to increase spending on administration, with a shadow cost of

$$\lambda'_c = \frac{-\partial\Omega}{\partial c}\Big/\frac{\partial R}{\partial c} = \frac{(\pi_{21} - \Psi_h\pi_{11})(\beta - 1)}{(\pi_{21} - \pi_{11})(\beta - 1) - 2/\Gamma}. \tag{24}$$

This method of raising taxes is equitable since type n farmers are likely to pay less in taxes ($\pi_{21} < 0$) and type h farmers more ($-\pi_{11} > 0$). But spending money on tax administration makes little sense when statutory rates Γ are low. It may be socially inefficient (no matter how equitable) to increase c if the consequent tax revenue collected is minimal.

Finally, the simplest choice available to the government is to simply raise the statutory tax rate Γ holding c constant. The shadow cost of raising revenue by increasing the land tax rate is

$$\lambda'_\Gamma = \frac{-\partial\Omega}{\partial\Gamma}\Big/\frac{\partial R}{\partial\Gamma} = \frac{1 + \pi_2(\beta - 1) + \Psi_h[\beta - \pi_1(\beta - 1)]}{1 + \beta + (\pi_2 - \pi_1)(\beta - 1) - \Gamma\pi_{12}(\beta - 1)^2}. \tag{25}$$

Raising the statutory tax rate Γ is not equitable if, for example, the degree of

existing tax evasion by type h farmers is high. The denominator suggests further that the effective tax revenue collection from increasing the statutory rate Γ may be diminished if as a consequence evasion becomes more widespread. Hence revenue is not simply a constant proportion Γ of total quality-adjusted land $1 + \beta$.

The following example illustrates how one might compare the three tax choices. Assume that high-productivity farmers enjoy only half the weight of normal farmers in the social welfare function ($\Psi_h = 0.5$), high-quality land is assessed at double the value of normal land ($\beta = 2$), the land tax Γ is 2.5 percent of the market value for land (normalized to one), the existing evasion rate is 25 percent ($\pi_1 = 0.25$), the export elasticity is 1.0, π_2 is zero, and $\pi_{11} = -100$ and $\pi_{12} = 50$. Assuming that $\pi_{11} = -100$ means that an increase in administrative expenses of 0.1 percent of land value reduces evasion by 10 percent. Assuming that $\pi_{12} = 50$ means that increasing statutory rates by 10 percent (from 0.025 of land value to 0.0275) increases evasion by 5 percent. Then the calculated values of the shadow prices λ' of raising \$1 of extra revenue through an increase in the export tax rate, land tax assessment effort, or land tax rate, are[21]

$$\lambda'_\tau = 0.95$$
$$\lambda'_c = 2.50$$
$$\lambda'_\Gamma = 1.25.$$

For these illustrative parameters, the export tax is the *leas:* costly way of raising revenues. In sum, accounting for the overall cost of the tax *system* inclusive of administrative and evasion costs, rather than just the distortions under particular tax rates, alters the traditional comparison of the land tax versus the export or commodity tax (Slemord 1990).

V. Conclusion and Discussion

Despite the theoretical pedigree of the agricultural land tax, its empirical importance in raising central government revenue continues to slide. This article has proposed three reasons for why the land tax has been allowed to decline in importance. First, current generations of landowners may suffer large capital

21. Additional parameter assumptions are that effective labor units on high-quality land, ξ, are 2 (implying, with $\beta = 2$, that $x_h^* = 2x_n^*$), and the existing export tax rate τ is 30 percent. Letting η_e be the export elasticity, the calculations are:

$$\lambda'_\tau = \frac{x_n^*(1 + 0.5\times 2)}{3x_n^*(1 - \tau\eta_e)} = 0.95\text{, from equation 23}$$

$$\lambda'_c = \frac{0.5 \times 100}{(100-2)/0.025} = 2.50\text{, from equation 24}$$

$$\lambda'_\Gamma = \frac{1 + 0.5(2 - 0.25)}{3 - 0.25 - 0.025 \times 50} = 1.25\text{, from equation 25.}$$

losses if land prices decline by the full present value of future tax assessments. But this is not a convincing explanation for why land taxes are now rarely used, since export taxes also depress land prices. In fact, replacing an export tax with a land tax could increase land prices.

The second reason is that relative to an export tax, the land tax thrusts more uncertainty upon the farmer. Regardless of the crop outcome, the land tax must be paid. However, numerical calculations suggested that the degree of uncertainty about farm income must be very large, and (in general) the level of taxation low, before an export tax is preferred to a land tax. Furthermore, the combination of both the land and export taxes will Pareto dominate either in isolation (Hoff, this issue).

Finally, administering the land tax is difficult. Farmers with high-quality land have a strong incentive to represent it as low-quality land. Since there are few penalties for underassessment, real resources must be expended by the government to prevent the land tax from collapsing to a pooling equilibrium in which all farmers pay the same fee per acre. Once administration costs are included, the land tax may be less efficient than an export tax.

Is this last problem—which I view as the most important defect of the land tax—a fatal shortcoming? When markets for land are thin or incomplete, the difficulty of assigning market value or net income to each parcel is likely to ensure that such land taxes are rarely used. But there are alternative methods of collecting land tax which avoid the necessity of tax assessors' placing a market value on each parcel with periodic updating. For example, a crude index of land quality depending on the soil type, distance from major roads, and irrigation facilities can be determined for each plot of land. The tax assessment could then be calculated by multiplying the year-specific tax rate by the permanent index, thereby avoiding the necessity for yearly reassessment.

Such a procedure holds promise, especially as technological methods of mapping and soil quality assessment improve. However, it is unlikely that the tax rate could be set at a high level, since net income from land may vary widely even within these crude assessments of quality, leading to horizontal inequities. My suspicion is that the administrative difficulties of collecting land taxes will ensure its continued decline in providing central government revenue in developing countries.

Local government land taxation apparently has not experienced the same decline in use.[22] One explanation may be that local governments have few other tax instruments available to them. Commodity taxes may be easily evaded, export taxes are unavailable, and income taxes in rural areas are impossible to administer. In this view, land taxes may be unappealing to local governments, but there are no better alternatives. Furthermore, modest local government revenue requirements imply a low land tax rate, reducing evasion and allowing for a simpler tax structure.

22. There are no comprehensive statistics on local government use of agricultural land taxation.

One shortcoming of the analysis to this point is that government tax choices are presumed to be guided by efficiency or equity considerations. An alternative view is that land taxation *is* more efficient and equitable than export taxation, but political barriers and vested interests have blocked its use. This is a theme often sounded in previous studies: "The weakness of land taxation is that while it arouses the opposition of the landed interests, it does not hold out an obvious appeal to any other important group" (Hirschman 1964, p. 433).

Examples of political opposition blocking land taxation abound. Most recently, a 1986 World Bank–financed project in Argentina laid the administrative groundwork for a new land tax designed to reduce its heavy reliance on export taxes. Agricultural political groups, viewing the proposed tax as yet another in a long history of revenue transfers from agriculture, effectively scuttled the proposal (Trapido 1988).

The historical evidence may appear perplexing in light of two results from section II implying that large landowners *should* support a revenue-neutral shift from export to land taxation. First, switching to a land tax may increase the value of land through capitalization effects. And second, replacing the export tax increases the domestic price of the tradable good and consequently benefits landowners at the expense of urban consumers. Why, then, the strong opposition to land taxation from landowners? The answer is that historically, land tax increases were rarely paired with export tax cutbacks. In Argentina, for example, the government made no pledge to reduce its export tax once the proposed land tax was implemented. Political objections by landowners were not surprising under those circumstances. By contrast, landowners in Uruguay during the late 1960s actively supported a land tax paired with a cut in export taxes (Jarvis 1986, 1987).

The question still remains as to why landowners object more vehemently to increased land taxes than to increased export taxes or various forms of implicit taxation. Perhaps the land tax is unpopular because it is explicit rather than implicit. Standard economic models do not admit any such difference between the two taxes. But there is some evidence that explicit tax payments generate more taxpayer resistance than implicit taxes collected at an intermediate stage of production, although such effects are difficult to measure.[23] Still, the secular decline of central government land tax revenue is a good example of how administrative difficulties can outweigh textbook efficiency.

Appendix: A Model of Uncertainty

The utility function in equation 17 can be expressed in its indirect form:

$$V(\tau, \Gamma; \epsilon) = (\phi_1 + \phi_2 + \phi_3)^{-1} \frac{m(\tau, \Gamma; \epsilon)^{\phi}}{(1 - \tau)^{\phi_1 + \phi_3} F_L(\epsilon)^{\phi_1}} \tag{A-1}$$

23. As Nicholas Stern has pointed out, Margaret Thatcher lost political ground over a very explicit poll tax. Her support for the poll tax was precisely to make explicit—and presumably less popular—the financing of local councils dominated by the Labour Party.

where $\phi = \phi_1 + \phi_2 + \phi_3$. Note that m must be derived implicitly, since F_L and F_T both depend on the marginal product of labor, $1 - l$, while the leisure demanded depends on total income m. The inner loop of the simulation therefore solves first for the optimal l conditional on the realization of ϵ and the tax and uncertainty parameters. The expected value of the indirect utility function is $0.5[V(\epsilon = \omega) + V(\epsilon = -\omega)]$.

Revenue is written

$$R' = \tau[w(1 - l) + F_T T] + \Gamma T. \tag{A-2}$$

In the counterfactual, the export tax is replaced with the land tax. This tax is adjusted using iterative methods in the outer loop until expected utility is equal to the baseline case of the export tax. If more revenue can be raised under the land tax holding expected utility constant, then the land tax is more efficient, and conversely. (The BASIC program is available from the author upon request.)

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Land Tenure and Property Rights: Theory and Implications for Development Policy

Gershon Feder and David Feeny

This article explores the nature of property rights systems, their evolution, and their effect on resource allocation. It is argued that certain institutional arrangements for land rights have evolved in order to reduce uncertainty and increase efficiency in credit as well as in land markets. Of particular relevance to developing countries, the article emphasizes the contribution of public sector infrastructure to effective land rights systems. An appendix to the article presents a formal model analyzing the effects of security of land rights on land prices, the intensity of cultivation, and the use of credit. Empirical evidence from Thailand supports several of the propositions derived from the model.

The system of private property rights in land found in modern Western economies is the product of centuries of economic, social, political, and legal change (North 1981). Most economic analyses presume Western-style exclusive, transferable, alienable, and enforceable private property rights in land. In this case, the traditional three pillars of economic theory, namely, resource endowments, technology, and preferences, are sufficient. The fourth pillar, institutions, can be omitted without seriously distorting the analysis. Yet both historically and in the contemporary world, especially in developing countries, the presumption of exclusive, transferable, alienable, and enforceable rights is frequently inaccurate and potentially misleading. In such cases the complex nature of institutional arrangements in general and property rights in particular needs to be described; the fourth pillar needs to be specified (Arrow 1985; Coase 1960; Feeny 1988a; Solow 1985).

This article focuses on how property rights in land affect resource allocation in agriculture in developing countries. A number of topics are considered, including conceptual issues concerning the nature of institutions and the definition of property rights. We consider the impact of land rights systems on incentives,

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uncertainty, and the operation of credit markets. Of particular relevance t developing countries, we emphasize the importance of public sector infrastruc ture in making land rights systems effective. A formal model analyzing th effects of property rights security on land values, the intensity of cultivation, an the use of credit is developed. The model highlights the strong interaction between security of property rights and credit markets. Empirical evidence fron Thailand supporting some of the propositions derived from the model is summa rized briefly.

I. PROPERTY RIGHTS AS AN INSTITUTION

In order to consider the role of property rights in general and land rights i particular, it is important to place these rights in the context of the overal institutional structure of the society and economy. There are three basic catego ries of institutions: constitutional order, institutional arrangements, and norma tive behavioral codes. The constitutional order refers to the fundamental rule about how society is organized—the rules for making rules. Institutional ar rangements are created within the rules specified by the constitutional order These arrangements include laws, regulations, associations, contracts, and th focus of this article, property rights in land. The third category, normativ behavioral codes, refers to the cultural values which legitimize the arrangement and constrain behavior. The constitutional order and normative behaviora codes evolve slowly; institutional arrangements may be more readily modified.

In developing countries that are undergoing evolution in all three categories o institutions there is the potential for a lack of congruence among the three type of institutions. Thus, although the formal legal system may provide for alien ability, the transfer of land to persons from another clan or ethnic group ma represent a violation of cultural norms. Similarly, although the constitutiona order may make provisions for private property rights and there may formall be laws establishing such rights, the corresponding registration and enforcemen mechanisms may be largely absent.

Property rights are an important class of institutional arrangement. In gen eral, "property as a social institution implies a system of relations betweer individuals. . . . it involves rights, duties, powers, privileges, forbearance, etc., of certain kinds."[1] Property rights are then a bundle of characteristics: exclu sivity, inheritability, transferability, and enforcement mechanisms (Alchian anc Demsetz 1973). Thus property rights define the uses which are legitimatel viewed as exclusive and who has these exclusive rights. Uses of land may includ hunting, passage, gathering, grazing, cultivation, the mining of minerals, the us of trees, and even the right to destroy the resources. For instance, in medieva England and contemporary South India, rights to the crop are private wherea

1. Hallowell (1943, p. 119); for a discussion on the historical evolution of the concept of property se Schlatter (1951).

rights to the stubble after harvesting are communal (Campbell and Godoy 1986; Wade 1986). Similarly, in many parts of Sub-Saharan Africa land and tree tenure are separate (Feder and Noronha 1987). Land rights may further specify the conditions under which various types of transfer of rights may be affected and the parties to whom such transfers may be made. Rights also have a temporal dimension. The institutional arrangements include mechanisms for defining and enforcing property rights; that is, they include both the formal procedures and the social customs and attitudes concerning the legitimacy and recognition of those rights (Taylor 1988). Enforcement depends on a constellation of supporting arrangements and mechanisms such as courts, police, financial institutions, the legal profession, land surveys, record-keeping systems, and titling agencies, in addition to the social legitimacy of property rights in land.

Four Categories of Property Rights in Land

There are four basic categories of property rights in land: none (or open access), communal property, private property, and state (or crown) property. Under open access, rights are left unassigned. The lack of any exclusivity implies the lack of an incentive to conserve, and therefore often results in degradation of scarce resources. Under communal property, exclusive rights are assigned to a group of individuals. Under state property, management of the land is under the authority of the public sector. In private property, an individual is assigned the rights.[2] These four categories are ideal analytical types. If the group holding exclusive communal rights is large enough, the distinction between communal property and open access becomes moot. If private property rights are not viewed as being legitimate or are not enforced adequately, de jure private property becomes de facto open access. Nonetheless the simple taxonomy is useful for describing property rights systems.

All or some of these categories of property rights may exist in a single society for different tracts of land. Furthermore, because of the multifaceted nature of property rights in land, the same tract of land can be categorized under more than one regime. In many societies, some or all land is constitutionally the property of the state, but exclusive use rights are given to individuals under a contractual arrangement with the state. If these use rights are transferable with few limitations, and if the contract is sufficiently long-term (for example, ninety-nine years), then for most of the contract's duration there is very little difference between possession of use rights and full property rights.

The changes in economic relations and in power structures that characterize the development process generate changing needs for property rights and for the

2. The term common property is sometimes used to refer to property that is classified as communal in the system used here, but it is also used to refer to open access situations. More generally, common property refers to situations for which exclusion is difficult and utilization involves rivalry. To avoid confusion, group ownership is therefore labeled as communal, rather than common property rights. For more on these distinctions, see Berkes and others (1989).

associated institutions to regulate or enforce them. In the early stages of agri cultural development, land rights may be split between individuals and th community. Individuals are assigned use rights (which can be long-term an inheritable), although the right to sell land or transfer the use right to nonheirs i retained by the community. Under circumstances where endowments are simila across households and land is abundant, such arrangements provide incentive to individuals to exert effort in tilling land and preserving fertility (throug secure and inheritable use rights), yet they minimize social tensions. Social un rest may emerge when individuals lose their land rights, especially to nonmem bers of the community, creating a landless class. When technology advances however, and endowments of labor and other productive assets differ amon households, the lack of transferability of property rights may adversely affe productivity. Efficiency considerations thus motivate changes both in the const tutional order and institutional arrangements relating to land rights.

Evolution of Land Rights: The Example of Thailand

Private property rights in land have evolved gradually in response to increase in the scarcity value of land and therefore the benefits to be derived from mor precise and secure land rights. When land was abundant and labor scarce property rights in labor (for example, slavery) were often defined with muc greater precision than property rights in land (Engerman 1973). For example, i land-abundant, labor-scarce, early-nineteenth-century Thailand, slaves rathe than land served as collateral in financial markets. There was a well-develope legal system to govern transactions in labor commitments. In contrast, the sys tem of usufruct land rights was not as extensively developed.[3] In theory all lan belonged to the king. In practice individuals were allowed to use the land fo cultivation, sell it, and pass it on to their heirs as long as they paid taxes on th land and did not leave it fallow for longer than three consecutive years.

With the increasing commercialization of rice production and exporting o rice, land values in Thailand appreciated, even though for much of the perio the area cultivated per person in fact increased. The agricultural terms of trad appreciated as international trading opportunities were opened up and transpo tation costs declined. The result was a rice export boom which induced a rapi expansion in the area under cultivation.

As land became more valuable and frontier areas were brought under cultiva tion, land disputes became endemic. The Thai government responded with series of procedural and administrative changes. A major new law on land right was enacted in 1892. Although it provided a more comprehensive framewor and more standardization of procedures for documenting land ownership rights the lack of adequate surveys and record-keeping continued to inhibit the precis documentation of rights; land disputes continued. In 1896 the government re sponded by initiating a cadastral survey in an area in which important govern

3. A detailed discussion of the evolution of land rights in Thailand is provided by Feeny (1982).

ment officials were also landowners, and in 1901 created a formal system of land titling. Cadastral surveys covering most of the commercialized areas in the central plain followed. Surveys were, however, not vigorously pursued in most other regions or in upland areas. Thai legislation continued to evolve. The result has been a compromise between the traditional practice of allowing citizens to bring unoccupied forest land under cultivation as private property and the requirements of the land titling system based on cadastral surveys. The compromise provides for several levels in the security and documentation of land rights. It is embodied in the 1954 legislation which provides the basis for the current system in Thailand.

In summary, the current system of land rights in Thailand developed in response to the increased benefits of defining property rights in land induced by the commercialization of agriculture and appreciation in the agricultural terms of trade. Government officials, as landowners, shared in the gains from titling and were therefore willing to supply the institutional changes being demanded, especially in those areas in which they owned land. Their motives also reflected the desire to provide mechanisms to resolve and reduce the incidence of land disputes.

This evolution is not unique to Thailand. Increasing population density, appreciations in the agricultural terms of trade, and technological change which made investments in land quality more profitable have enhanced the benefits from creating more precise private property rights in land.[4] The processes which helped to shape the historical development of land rights in Thailand and in the West are very salient today in many developing countries. Population pressure on land resources is common. Many new technologies have increased the returns to farming. The demand for institutional arrangements to describe and enforce property rights in land with more precision is thus a common feature of many developing countries.

II. Consequences of Land Rights Systems: Intuitive Propositions

Systems of property rights in land, by assigning and enforcing the gains and losses from actions to agents, have a profound effect on incentives and on the scope of market transactions in land and credit (where land is often used as collateral). Here we summarize the nature of these effects.

Incentives

Property rights provide agents with the incentives to use land efficiently and to invest in land conservation and improvement. The establishment and enforcement of these rights are, however, not costless. When land is abundant, the gains afforded by enhanced property rights may be more than offset by the transaction

4. See Feeny (1988b), Libecap (1986), Roumasset and LaCroix (1988), and Umbeck (1977) for examples of the process.

cost of providing for the property rights. If land becomes scarce, however, or changes in technology create new investment opportunities, the forgone gains become more important and the provision of property rights in land then has the ability to enhance productivity. Communal rights may represent the best arrangement for situations in which the opportunities to invest in the quality of the land are limited and the community is small, but because land is sufficiently scarce it pays to exclude outsiders from using it. In such a situation communal rights economize on transaction costs. Outsiders are readily detected, and the entire community has an incentive to enforce their exclusion. The small size of the community implies that the transaction costs of regulating use among members are not prohibitive. It is often observed in larger communities, however, that mechanisms for imposing restrictions on individuals' land use patterns which are harmful to the group's interest are deficient, and communal ownership then leads to efficiency losses. Furthermore, when new market opportunities arise or new technologies provide large benefits from investments, communal rights may no longer provide sufficient incentives.

Asymmetric Information and Uncertainty

Given the effect of land rights systems on incentives, it follows intuitively that risks to the possession of such rights (for example, the risk of state expropriation, of private challenges to land rights, or of tenure agreement cancellation faced by a tenant) will hurt production and investment. Here we wish to emphasize a particular aspect of efficiency loss due to asymmetric information. In the early stages of agricultural development, transactions in land take place mainly among members of the same community. Information is thus fairly symmetric: the identity of those who possess transferable rights over specific tracts of land is reasonably well known to all members of the community. With more advanced stages of development and increased mobility of individuals and entrepreneurs, transactions among individuals who are not members of the same community are more frequent. As a result, the scope for asymmetric information, and hence land disputes, increases. The price of land will then not reflect its true social value, and the extent of land transactions will be less than optimal. Land transactions generally increase efficiency in resource allocation, as agents with high (potential) marginal productivity of land are induced to acquire land from agents with low marginal productivity.

In order to reduce the inefficiencies arising from uncertainty, societies develop sophisticated institutional arrangements for recording and enforcing land rights. One such arrangement is a centralized public record of land tracts and the possessors of rights over these tracts. Such records have coverage at various levels of geographic units (for example, county, provincial, or national), presumably with higher costs as the unit of coverage expands. As early as 600 B.C., the Bible (Jeremiah, chap. 32) describes that for a land transaction between the prophet Jeremiah and a relative, two copies of the record of the transaction were kept with a certain priest in the capital, Jerusalem. This arrangement gave

individuals who were considering buying or renting land from others a way to verify that the rights they were about to purchase did indeed belong to the seller or lessor. In later times, officially maintained land records and title documents became much more systematic.

A central record is of course only one of the institutions designed to reduce uncertainty. A functioning legal system and effective enforcement mechanisms are necessary as well. In the absence of such public services, each individual will increase his private allocation of resources for enforcement through the use of, for example, guards or elaborate fences. It is more efficient to reduce the risk (at least partially) through a public good (police, judiciary), than through individual actions only.

Risk and asymmetric information with respect to land rights are particularly extreme in frontier areas where land which was previously ownerless (it may have been formally state-owned) is being claimed by individuals migrating from other areas. In such circumstances there is no established community from which knowledge can be obtained. The large number of claims and challenges to claims typically overloads the administrative infrastructure (land record offices, courts, and police), and it is not uncommon in such areas to find private (and necessarily segmented) institutions to protect property rights over land (gunmen, fortified properties).

Land Rights and Credit Transactions

The business of lending is inherently risky. The use of collateral on loans reduces uncertainty and moral hazard problems for creditors. Collateral is more valuable the more immobile and immune to damage it is, and land has traditionally been an ideal collateral asset in areas where land is scarce (Binswanger and Rosenzweig 1986). The emergence of profit-motivated credit activities (whether formal or informal) among agents within and outside established communities is frequently an important element in inducing institutional change with respect to land rights.

Land's usefulness as collateral is dependent on the absence of uncertainty and asymmetric information with regard to the rights (in particular, transfer rights) of the operator-occupier. A lender, for the same reasons which concern a potential buyer or renter, would like to be assured that the borrower-operator has indeed the right to dispose of the land by sale or transfer or the right to transfer use rights (a well-defined set of use rights over a sufficiently long time period has a capitalized value which can serve as collateral). The availability of land as collateral, and documentation of land rights which make such collateral credible, affect the willingness of creditors to make loans (Feder, Onchan, and Raparla 1988). In addition, formal procedures for registering liens on property rights provide important enforcement mechanisms. Thus the same institutional arrangements that increase incentives for productive use of land also facilitate a more efficient credit market.

Formal procedures, however, may also entail high transaction costs. There is

:vidence of analogous informal mechanisms with lower costs. For instance, one levice is for the debtor to leave the physical title (document of land rights) on leposit with the creditor. Although this does not provide for the formal registra- ion of the transaction and therefore does not provide for a secure mechanism 'or foreclosure in the event of default, it does give the creditor the ability to :nsure that the property is not disposed of without his interests being protected. t also gives the creditor the ability to limit indirectly the total liabilities of the lebtor in that other formal (or informal) procedures requiring the presentation of the title cannot be performed without the knowledge of the creditor. Formal ind informal practices of this nature have been observed in various countries in Africa, and in India and Thailand (Meek 1946, p. 256; Stifel 1976). A contem- orary informal variation which has emerged in Thailand recently is a signed ower of attorney agreement for the debtor to retain use of the land while eaving the land title document with the creditor (Siamwalla and others 1990, p. !80). The availability of the land title document provides the creditor with idded security, making it possible for creditors to extend credit to persons with vhom they would otherwise not be sufficiently familiar. For the debtor these nformal arrangements provide access to larger sums at lower rates and reduce narket segmentation.

Public Sector Resources to Promote Land Security

In the rural areas of many developing countries the institutional arrangements iecessary to provide incentives and reduce uncertainty and asymmetric informa- ion are often not well developed or are largely absent. This is not because the orces which tend to generate these institutional arrangements are absent, be- ause these forces are clearly present in many instances: high population-to-land atio, technology requiring fertility enhancement, and active or potential credit narkets in which property rights in land could serve as collateral. Rather, the eficiencies stem from the overall inadequacy of public resources. The adminis- ration dealing with land records may suffer from deficient technology (for xample, handwritten record retrieval methods when microcomputers would be nuch more efficient), insufficient labor resources, and inappropriate storage acilities. The judicial and police systems may be understaffed or underpaid, vhich creates conditions for rent-seeking and for a slow process of property ights enforcement.

In some countries the legal apparatus defining property rights may be exces- ively complex and require various types of documents and affidavits which may e useful in an urban context but not in an agricultural context. The complex- ies increase the fixed transaction cost associated with enhancing the security of roperty rights (for example, requiring the assistance of expensive lawyers and emanding substantial time inputs from farmers.) This may create a stratifica- on whereby wealthier and larger farmers find it easier and more worthwhile to nance these transaction costs (which tend to be relatively size-invariant), vhereas smaller and poorer farmers would not undertake them.

The inadequacy of public sector resources for reducing uncertainty in property rights is aggravated by a public institutional framework that makes it difficult or impossible for private sector agents to substitute, if only in part, for the lack of public infrastructure. In some countries, private land surveyors are not recognized and certified, or the facilities to train such surveyors are not established. The verification of boundaries and the resultant improvement in ownership security is thus totally dependent on public sector land surveying, which is a function of public budgets.

Such circumstances do not allow a significant reduction of the uncertainty regarding property rights which the formal public sector institutions are supposed to bring about. Instead, one frequently finds an emergence of localized and informal risk-reducing institutional arrangements which may be less effective than a well-functioning formal institution but are better than no institution. The segmented nature of these local arrangements implies a smaller volume of transactions than that which would take place otherwise, and thus a less efficient resource allocation.

A typical example is to be found in the western expansion period of the United States (Anderson and Hill 1975; Dennen 1976). Under the provisions of homesteading, ranchers in the Great Plains were able to claim as private property parcels of land which were too small to support large herds of livestock. Ranchers therefore supplemented grazing on private lands with grazing on the public domain, which created the potential for conflicts.

Voluntary collective action in the form of cattlemen's associations helped to ameliorate the situation. The cattlemen's association provided informal property rights to the range, organized the spring round-up (an activity for which there were economies of scale), and helped in the recognition and enforcement of brands, a means for recording private property rights in livestock. These mechanisms were especially important in the period before the availability of barbed wire, a cheap means of enforcing rights to the range in a natural environment in which wood, stone, and other traditional fencing materials were scarce.

III. A Model of Investment, Production, and Land Price Determination, and Some Empirical Evidence

In this section, we summarize the results of a formal model which is presented in the appendix. The model makes a number of simplifying assumptions, but it nonetheless captures important characteristics of a rural economy in which land rights are subject to risk. The link between land rights and the credit market is incorporated through the assumption that the supply of credit available to farmers is positively related to the value of their landholdings (as it would typically be when land is a collateral for loans) and negatively related to their probability of land loss.

The model assumes that the objective of farmers is to maximize their utility of

urrent consumption and next period's wealth by allocating their initial endow- nent and borrowed funds to three uses: current consumption, land acquisition, nd investment in physical capital. Land and capital are used to produce their ext period's output through a neoclassical production function. Output and ınd value, minus debt repayment (principal plus interest), make up the next eriod's wealth. The risk to property rights is represented by a nonzero proba- ility that land (and the output derived from the land) will be lost in the next eriod to the present decisionmaker. The farmer thus perceives an *expected* alue of the next period's wealth that depends on the probability of land loss.

The model confirms that optimal allocation implies a negative relation be- veen land price and the demand for land, as one would indeed expect in an rdinary demand function. The capital-to-land ratio, however, is positively re- ıted to the price of land, because as land becomes more expensive, capital is ıbstituted for land (current consumption would increase as well). An increase ı the risk of land loss would, if land price were to be held constant, reduce both ıe demand for land and the total demand for capital, as the output to be roduced by these factors has a lower probability of materializing, and because ıe likelihood that land will remain part of the farmer's wealth declines. Another ːason for the decline in demand for these factors is that the supply of credit is ːgatively affected by the increased risk to the viability of land as collateral.

Land prices, however, cannot remain unaffected by increases in the risk of nd loss, because as farmers reduce their demand for the fixed supply of land, ı excess supply is created which drives down the equilibrium price. Land prices ·e thus shown to be negatively related to the riskiness of land rights. The ·duction in land values with increased risk diminishes further the supply of ·edit per unit of land. Whereas the total amount of land employed in equilib- um is fixed, the reduced supply of credit per unit of land reduces the total nount of capital acquired. As a result, at equilibrium the capital-to-land ratio ːclines, and hence output per unit of land falls.

The model indicates that the equilibrium price of land contains a "collateral ·emium" which is a result of the owner's ability to obtain additional and ıeaper credit by pledging the land as collateral to overcome the information ·ymmetry in the credit market. This has an important implication for the ıancing of land acquisitions: as the sales value includes the collateral premium, e purchaser will not be able to pay for the land out of the benefit stream unless : acquires it out of equity, at least in part. In the context of land reform, ndless beneficiaries with no equity cannot therefore be expected to compensate rmer owners at full market price from the revenues of the farm.

Social welfare in one period is defined as the expected value of output minus e value of real resources (capital) consumed in the process of production. The ıalysis indicates that under ideal conditions (that is, no risk of land loss and an terest rate which equals the rate of time preference) the price of land equals the scounted value of the stream of social welfare generated by a unit of land. 'ith a nonzero risk to land rights, the price of land will be lower than its social

value (that is, the stream of net benefits generated by it). The reason for this distortion is that the risk of losing land, aside from causing temporary output reduction (which is a loss to both the individual and society), is also a risk of asset loss to individuals. Society does not, however, risk a loss of the land, which will remain a productive asset regardless of whether it is possessed by any specific individual. This deviation will cause a difference between private and social assessments of the benefits of eliminating the risk to property rights: individuals will be willing to support a larger expenditure toward eliminating uncertainty than is socially optimal.

A caveat is in order with respect to this result. The model assumes that farmers are identical in their farming skills and differ only in their endowments. In reality, however, there are differences among farmers in their farming skills. This implies that the elimination of uncertainty, to the extent it expands the land market, will bring social benefits by facilitating sales of land by individuals with low productivity to ones with high productivity. This benefit may not be fully reflected in private valuations of reductions in uncertainty and can thus introduce a countervailing effect to the model's results.

Empirical results from a case study in Thailand confirm many of the propositions propounded in this and the preceding section. The study, reported in Feder and others (1988a, 1988b), compared the performance of squatters on state land, who lack titles on land they farm, with that of titled farmers. The results show that titled land—rights to which had relatively little asymmetry in information—bore little risk of expropriation, provided better access to credit, and had a significantly higher market value as compared with squatters' land. Titled farmers had a larger volume of investment, higher likelihood of land improvements, more intensive use of variable inputs, and higher output per unit of land.

A surprising finding was that most of the impact of title ownership in this particular case stemmed from the fact that titles increased farmers' access to formal credit, rather than from elimination of actual risk to the land rights of the farmers. For example, in a comparison of two groups of squatters, one of which was granted official acceptance but not permission to legally transact in land, no difference in performance was apparent. Both groups were, of course, unable to pledge their land as collateral for a debt. Similarly, of three areas studied, in the area in which the dominant source of credit was the informal credit market (in which information asymmetry is small as compared with the formal credit market), the differences between land values and agricultural performance of titled and untitled farmers were the smallest. As confirmed through other sources, the risk to squatters' land rights in Thailand is not significant because eviction by the state would be politically costly. Formal credit institutions, however, do not accept land as collateral without formal title for reasons related to information asymmetry. A calculation over all survey areas of the costs and benefits of providing squatters with legal title ownership shows that the benefits outweigh the costs by a wide margin.

IV. Conclusions

The definition and institutionalization of property rights in land have been an important issue for societies throughout history. The nature of these rights and the way they are enforced have significant consequences for resource allocation and economic efficiency. Changes in population density, technology, and political power generate changes in the assignment of property rights and in the institutional arrangements associated with these rights. Generally, secure individual property rights over land, or secure and long-term use rights on land induce exertion of higher levels of labor and management effort and higher levels of investment to protect or enhance land fertility. There are exceptions to this proposition, such as cases in which unregulated individual use generates externalities. The provision of secure individual property rights requires not only social rules for allocation of land rights, such as a constitution which recognizes individual land rights, but also adequate implementation and enforcement mechanisms. In the absence of such mechanisms, uncertainty regarding land ownership rights will generate inefficiencies in the allocation of resources. The inefficiencies are aggravated if the use of land as collateral affects credit availability. In this case, the same institutions which improve the efficiency of the land market will also increase efficiency in credit markets.

Asymmetry in information regarding the allocation of land rights between agents transacting in land is another potential source of inefficiency which is likely to increase with agricultural development. The asymmetry promotes the segmentation of land markets, constraining the volume of transactions and thus hindering efficient resource allocation. Various institutional arrangements were developed over time to reduce the extent of asymmetric information, such as land records and title documents. These arrangements typically require public sector involvement because of economies of scale and complementarity with other public sector activities—for example, cadasters for taxation purposes and judicial and police functions.

Although there are obvious social benefits to the provision of secure property rights and to the removal of information asymmetry, there is a likelihood that private benefits of secure land ownership rights exceed the contribution of such security to society's resources. Such a situation may imply that individuals are willing to support policy measures to improve ownership security to a point at which marginal costs exceed the marginal gain in net output. Appropriate taxes or user charges can be used when implementing some of the institutional arrangements to enhance the security of land rights, so as to bring individuals' willingness to support such programs in line with the net gains accruing to society as a whole. The gains in land and credit markets' efficiency which result from reduction of uncertainty in land rights, however, may generate externalities countervailing the excess valuation of security by individuals and, in any case, are a social benefit of considerable magnitude in economies where these markets are relatively free. The total social benefits of improving security of land rights

in such economies are therefore likely to exceed social costs, although the exact optimal extent of security enhancement (and the associated costs) will require an assessment based on the specific situation being considered. But in areas where credit and land markets are not yet developed, an investment in titling and land registration may entail an excessive cost in comparison with the benefits, and security of tenure can be enhanced by cheaper methods such as legalizing the authority of local institutions.

Appendix: A Model of Investment, Production, and Land Price Determination

For simplicity assume a two-period horizon, in the first period of which land acquisition, consumption, and investment decisions are made that determine production in the second period. Capital is completely used up in the process of production. Capital is the numeraire good, with price 1, and is available with infinite supply elasticity to the rural sector. Individuals maximize an expected utility function which is separable into two arguments: current consumption and terminal wealth. A further simplification is that the utility function is linear in terminal wealth. Risk to property rights is introduced through a nonzero probability ϕ that the land and its second-period output will be taken from the current decisionmaker, for example, through takeover by other individuals by force or legal challenges. The possibility of gaining land through such actions is viewed as an exogenous probabilistic event. Although the benefits of such a windfall should enter the objective function, it can be shown that this element does not affect the results of the model, and for simplicity it is not included explicitly.

The notation used in the model is: T = land, P = price of land, k = capital-to-land ratio, C_0 = first-period consumption, W_0 = initial wealth, ϕ = probability of ownership loss, U = utility of first-period consumption, and y = output per unit of land.

Model Components

The production function exhibits constant returns to scale in land and capital. The per hectare output is therefore

$$y = y(k); \quad y' > 0; \quad y'' < 0 \tag{A-1}$$

Utility of current consumption is a concave function with decreasing marginal utility:

$$U = U(C_0); \quad U' > 0; \quad U'' < 0 \tag{A-2}$$

Individuals maximize their expected utility, which is composed of the utility of current consumption plus their expected terminal wealth. Terminal wealth is equal to output plus land value in the case that land rights are not lost. Maximization is subject to a budget constraint whereby the value of land, capital, and current consumption cannot exceed initial wealth plus borrowed funds.

It is assumed that credit is rationed, and that the ration is binding for all farmers. The ration is proportionate to a borrower's landholding value with land serving as collateral. Denote the proportion by s. The total credit ration (say, S) is positively related to land's ownership security, that is:

$$S = s(\phi)PT: \quad s' < 0; \quad 0 < s < 1 \tag{A-3}$$

A fixed rate of interest (r) is assumed. The model could be developed with an assumption of an interest rate dependent on risk to property rights, which would yield even stronger results. Because all farmers are assumed to be rationed, the marginal productivity of capital is necessarily higher than the cost of credit.

If land rights are lost in the second period, the farmer is still obliged to pay the debt acquired in the first period. (It could be assumed that only a proportion of land is lost, say, γ, and that farmers repay their debts from their remaining wealth. In this case, the results of the model would be practically unchanged, with the term $\gamma\phi$ replacing ϕ in all derivations. For simplicity, the calculations in the text assume $\gamma = 1$. Even though all debt is ultimately repaid, lenders are concerned about the risk of land loss because of the transaction cost of collecting debts from dispossessed farmers. This motivates the assumption that the credit ration depends on land security, as in (A-3).

The farmer's objective function is

$$\max_{C_0, T, k} U(C_0) + (1 - \phi)T[y(k) + P] - (1 + r)s(\phi)PT \tag{A-4}$$

subject to the budget constraint

$$W_0 + s(\phi)PT = kT + PT + C_0 \tag{A-5}$$

From (A-5) one obtains

$$C_0 = W_0 - kT - PT + s(\phi)PT \tag{A-6}$$

Thus, the objective function can be written

$$\max_{T,k} U[W_0 - PT(1 - s) - kT] + (1 - \phi)T[y(k) + P] - (1 + r)s(\phi)PT \tag{A-7}$$

First-order conditions for a maximum are

$$(1 - \phi)(y + P) - U' \; [P(1 - s) + k - (1 + r)s(\phi)P] = 0 \tag{A-8}$$

$$(1 - \phi)Ty' - TU' = 0 \tag{A-9}$$

The Hessian matrix is

$$[H] = \begin{bmatrix} U''[P(1 - s) + k]^2 & U''[P(1 - s) + k]T \\ U''[P(1 - s) + k]T & T(1 - \phi)y'' + T^2U'' \end{bmatrix} \tag{A-10}$$

Second-order conditions are clearly satisfied as the determinant is positive:

$$|H| \equiv \Delta = T(1 - \phi)U''[P(1 - s)P + k]^2y'' > 0. \tag{A-11}$$

(because $U'' < 0, y'' < 0$).

The impact of a change in land price is given by:

$$\text{(A-12)}\quad [H]\begin{bmatrix} \dfrac{dT}{dP} \\ \dfrac{dk}{dP} \end{bmatrix} = \begin{bmatrix} (1-\phi)\dfrac{(y-y'k)}{P} - U''[(1-s)P+k](1-s)T \\ -T^2U''(1-s) \end{bmatrix}$$

where use has been made of equations (A-8) and (A-9). The concavity of y implies $y > y'k$.

Using Cramer's rule, one obtains:

$$\text{(A-13)}\quad \frac{dT}{dP} = \frac{1}{\Delta}\Big\{(1-\phi)\frac{(y-ky')}{P}[T(1-\phi)y'' + T^2U''] - U''[(1-s)P+k]T^2(1-s)(1-\phi)y''\Big\} < 0$$

That is, the demand for land is negatively related to its price, as intuitively expected. The sign can be established by noting the concavity of y and U. From Cramer's rule, one also obtains

$$\text{(A-14)}\quad \frac{dk}{dP} = -(1-\phi)\frac{(y-ky')}{P}U''[(1-s)P+k]\frac{T}{\Delta} > 0$$

That is, the capital-to-land ratio increases with land price. This is also intuitively expected, because with higher land prices, farmers will substitute capital for land in production.

Because the demand for land is monotonically and negatively related to the price of land, and given that the supply of land is fixed, there is a stable equilibrium price of land which depends on the parameter ϕ, the risk to ownership. Intuition suggests that an increase in the probability of loss of land rights should reduce the demand for the risky asset (land) if land prices are fixed. This is confirmed by the following derivation:

$$\text{(A-15)}\quad [H]\begin{bmatrix} \dfrac{dT}{d\phi} \\ \dfrac{dk}{d\phi} \end{bmatrix} = \begin{bmatrix} y + P - [(1-\phi)y' - (1+r)]Ps' + TU''[(1-s)P+k]Ps' \\ Ty' + T^2U''Ps' \end{bmatrix}$$

Denote the first element in the vector on the right-hand side of (A-15) by θ, and note $\theta > 0$, because $(1-\theta)y' - (1+r) > 0$ if the credit constraint is binding. Then, using Cramer's rule and equations (A-8) and (A-9)

$$\text{(A-16)}\quad \frac{dT}{d\phi} = \frac{1}{\Delta}\{\theta T(1-\phi)y'' + [T^2(1+r)sPU''/1+\phi] - T^2U''[(1+\phi)y' - (1+r)]Ps'\} < 0$$

$$\text{(A-17)}\quad \frac{dk}{d\phi} = \frac{1}{\Delta}\{[(1-\phi)y' - (1+r)]Ps' - [(1+r)sP/(1-\phi)]\}TU'' > 0$$

Thus an increase in the risk of land loss would increase the capital-to-land

ratio if land price were held constant. This result obtains even though the relative prices of credit and land are held constant, because the incentive to buy land due to its credit-enhancing role (aside from its productive contribution) has been diminished, and therefore the ratio of marginal contributions of land and capital has changed. The overall demand for capital, however, will decline with an increase in risk to land rights even when land prices are fixed, because the higher risk reduces the expected return on investment. This can be verified by calculating

$$\frac{d(kT)}{d\phi} = \frac{Tdk}{d\phi} + \frac{kdT}{d\phi}$$

utilizing equations (A-16) and (A-17).

While the capital-to-land ratio increases with risk when land price is fixed, the relation is reversed in equilibrium. An increase in ownership risk reduces the demand for land ($dT/d\phi < 0$), whereas the supply of land is fixed, so that the price will decline to equate demand to the fixed supply. Using equations (A-13) and (A-16), one can show that the price of land in equilibrium will decline, ($dP/d\phi < 0$).

$$\text{(A-18)}\quad \frac{dP}{d\phi} = -\ \{\theta T(1-\phi)y'' + [T^2(1+r)sPU''/(1+\phi)] - T^2U''[(1-\phi)y' - (1+r)]Ps'\}\{(1-\phi)[(y-ky')/P] \; T(1-\phi)y'' + T^2U'' - U''[(1-s)P+k]T^2(1-s)(1-\phi)y''\}^{-1} < 0$$

In this model, in which credit availability depends on the riskiness of the land collateral, the impact of higher ownership risk on the price of land has two components. The first term of the right-hand side of (A-18) reflects the impact of risk on the farmer's resource allocation: as uncertainty increases, present consumption is preferred to future wealth accumulation, and the demand for land is reduced while the supply is fixed, which requires a price reduction to restore equilibrium. The second and third terms on the right-hand side of equation (A-18) reflect respectively the impact of land ownership and ownership risk on the supply of credit: as uncertainty rises, the farmer's access to credit for land purchases or capital diminishes and the demand for land is reduced. If there were no credit market ($s = 0$), or if credit supply was not affected by ownership risk ($s' = 0$), then these components would vanish, but land value would still be negatively affected by higher ownership risk. These results also demonstrate the link between land price and land's role as a collateral. The price of land includes a premium reflecting the additional income due to the credit which can be acquired by pledging the land, and which in turn increases, at the margin, the farmer's utility.

The change in the equilibrium capital-to-land ratio following an increase in risk and the subsequent reduction in land price can be calculated (using equations (A-12), (A-14), (A-16), (A-17), and (A-18)) as:

$$\frac{dk^*}{d\phi} = \frac{dk}{d\phi} + \frac{dk}{dP}\frac{dP}{d\phi} = \frac{dk}{d\phi} - \frac{dk}{dP}\frac{[dT/d\phi]}{[dT/dP]}$$

$$\text{(A-19)} \quad = (\{[Ty'(1-\phi)(y-y'k)/P] + TU''(r+\phi)s' + T^2U''(1-s)\{[(1-s)P+k]y' - (y+P)\}\}) [(dT/dP)\Delta]^{-1} < 0$$

where * denotes equilibrium value after market adjustments have taken place. Equation (A-19) confirms that equilibrium capital-to-land ratios decline as a result of higher uncertainty. The intuition is that higher ownership uncertainty increases current consumption at the expense of demand both for land and capital goods. But the price of land declines to clear the market at the original level of land use as the supply of land is fixed. All of the decline in the purchase of investible resources is thus absorbed by the capital good, reducing capital-to-land ratios. The increase in uncertainty thus causes a decline in output per unit of land.

Valuation of Policies to Eliminate Uncertainty in Land Rights

Suppose that whenever property rights are challenged, the production process is interrupted and one period's output is lost. Then the expected net benefit to society from a unit of land in one period is $[1-\phi]y - U'k$, where the capital stock consumed in the process of production is evaluated in terms of its marginal welfare opportunity cost (U'). Denote $U' = 1 + \delta$, where δ may be viewed as a time preference premium, because one unit of second-period wealth yields U' units of utility if transferred to the first period. Then, rearranging equation (A-8), one obtains

$$\text{(A-20)} \qquad (1-\phi)y - (1+\delta)k = [(r-\delta)s + \phi + \delta]P$$

Define net social benefits as the value of net addition to economic resources (that is, output less the real value of resources used in production). Integrating both sides of equation (A-20) over an infinite time horizon and using δ as a discount factor, the total discounted net social benefits generated by a unit of land are

$$\text{(A-21)} \qquad \int_{t=0}^{\infty} [(1-\phi)y - (1+\delta)k]e^{-\delta t}dt = \left[1 + \frac{\phi}{\delta} - \frac{(\delta - r)s}{\delta}\right] P$$

When there is no risk and no credit market distortions (such that $\phi = 0$, $\delta = r$), the right-hand side reduces to P. The price of land reflects exactly the net social benefits it generates. In the presence of risk and distortions, the price of land differs from the net social benefits. One reason is that the possibility of asset ownership loss is a risk of capital loss to individuals, but not to society, which risks only one period's output. The second source of deviation comes from credit rationing. When credit is priced below the opportunity cost of capital ($U' > 1 + r$), the value of the subsidy is capitalized in the land value.

To evaluate private and social benefits from policies and institutions eliminating uncertainty in property rights, denote P_ϕ as the price prevailing when the probability of land loss is ϕ, while P_0 is the price when there is no risk. Also, assume for simplicity that there are no credit market distortions ($r = \delta$). The benefit to an individual (per unit of land) from institutional arrangements that

eliminate the risk of losing property rights can be expressed as the difference between land prices without and with risks ($P_0 - P_\phi$).

Denoting the left-hand side of equation (A-21) as B_ϕ, the benefits to society (the discounted expected addition to resources) from elimination of risk to property rights in land are given by

$$B_0 - B_\phi = (P_0 - P_\phi) - \frac{\phi P_\phi}{\delta} \tag{A-22}$$

The net addition to society's resources is thus smaller than the benefits to individuals.

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Indigenous Land Rights Systems in Sub-Saharan Africa: A Constraint on Productivity?

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This article uses cross-sectional evidence from Ghana, Kenya, and Rwanda in 1987–88 to examine the question, Are indigenous land rights systems in Sub-Saharan Africa a constraint on productivity? The evidence supports the hypothesis suggested by historical studies, that African indigenous land rights systems have spontaneously evolved from systems of communal control towards individualized rights in response to increases in commercialization and population pressure. Cross-sectional data on the incidence of land improvements and on land yields provide little support for the view that limitations under indigenous law on the right to transfer land are a constraint on productivity.

Within the context of Africa's rapid population growth and the need for increased productivity of land, there is a growing debate about whether the indigenous land tenure systems are a constraint on agricultural transformation. Some authors, such as Dorner (1972), World Bank (1974), and Harrison (1987), see the indigenous tenure systems as static constraints on agricultural development, providing insufficient tenure security to induce farmers to make necessary land-improving investments. Others, however, such as Cohen (1980), Boserup (1981), Noronha (1985), and Bruce (1988), have countered that the indigenous tenure arrangements are dynamic in nature and evolve in response to changes in factor prices. In particular, it is argued that there is a spontaneous individualization of land rights over time, whereby farm households acquire a broader and more powerful set of transfer and exclusion rights over their land as population pressure and agricultural commercialization proceed.

The issue is far from academic, because it brings into question the very need for expensive land registration and titling programs at this stage in the economic development of Sub-Saharan Africa. If the indigenous tenure systems are dynamic, then it is relevant to ask if there are more useful things that governments can do to facilitate the process of adaptation.

Up to now, the debate has been carried out without benefit of empirical tests of the performance of indigenous land tenure systems or of the effect of land

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titling on agricultural output. This article takes a first step in providing empirical testing of the relationship between indigenous tenure arrangements and agricultural productivity. New data are presented from a recently completed study of land rights systems in Ghana, Kenya, and Rwanda. We use the results from that study, together with historical evidence, to argue that, at least in rainfed cropping areas, indigenous African tenure systems have so far been flexible and responsive to changing economic circumstances. Where population pressure and commercialization have increased, the indigenous tenure systems have autonomously evolved from a system of communal property rights towards one of individualized rights. Controlling for differences in land quality and farmer characteristics, there is at best a weak relationship between individualization of land rights and land yields in the regions surveyed.

The article is organized as follows. The next two sections describe the characteristics and evolution of indigenous land rights systems in Sub-Saharan Africa. Section III presents results from our cross-sectional study in Kenya, Ghana and Rwanda. Section IV discusses government interventions in land tenure systems, and section V concludes with directions for policy.

I. The Nature of Indigenous Tenure

Africa has a wide variety of ecological conditions, cultural systems, and political structures. It is therefore somewhat dangerous to make general assertions about the nature of indigenous land rights systems. But some common features may still be discerned. Several interrelated themes have influenced the standard conceptualization of African land tenure systems and will be summarized here.

Until recently, indigenous African land rights systems have been incorrectly presented by most foreign anthropologists, colonial administrators, and nationalist idealists as static polar contrasts to Western property rights systems. It is asserted that indigenous tenure systems assign land rights to the community, and that communal control discourages long-term investment in land improvements. The argument is that individual farmers, not having secure private rights to the land, may not be able to claim fully the returns on their investment. To the extent that investments are required for conservation purposes, indigenous tenure arrangements will also potentially promote land degradation.

Further, it is asserted that because land is an integral part of the social system and legitimate use is determined by birth, affinity, common residence, and social status or some combination of these, transactions are limited to the members of the lineage. This encumbers the emergence of market transactions in land in which access would be determined by supply and demand factors and entrepreneurial ability. Contrasted to this picture is the idea that "modern" (implicitly "Western") property rights systems should be founded on principles of contractual law and economic efficiency.

But often ignored is the fact that, except in very isolated cases, communal control over land under indigenous tenure systems today occurs mainly in areas

characterized by relative land abundance and low intensification; but even then, farmers typically have secure use and inheritance rights. Historical records suggest that indigenous tenure had demonstrated remarkable flexibility in adapting to new farming technology or methods of exchange long before the colonial period (Morgan 1969; Hill 1963; Jones 1980; Bates 1986).

The contrast between indigenous African tenure and Western property rights systems should be perceived not in terms of polar extremes but as points along a continuum, the particular location of which is determined by population pressure, and the degree of commercialization of agriculture. Evidence from different locations in Africa confirms instances of autonomous intensification and privatization of rights in land since the beginning of the century (Netting 1968; Lagemann 1977; Ruthenberg 1985). Section III of this article presents new cross-sectional evidence of evolution of indigenous land rights systems in Ghana, Kenya, and Rwanda.

II. Agricultural Intensification and the Evolution of Indigenous Land Rights Systems

Reduced to its bare essentials, agricultural intensification entails a multidimensional process of response to increasing population density, technological change, and commercialization, or to any combination of these. It is characterized by substitution of labor for land in the initial stages and a shift from forest fallow through bush and grassland fallow. This is followed by more continuous cropping and systems of crop rotation and soil improvement (including green and animal manures, and compost), followed by additional modern yield-enhancing inputs such as chemical fertilizers, insecticides, and high-yielding seed varieties (Boserup 1965; Geertz 1963; Netting 1968; Waddell 1972; Pingali and Binswanger 1986).

Agricultural intensification has often occurred in response to the creation of new markets following the separation of consumption and reproductive objectives from those relating to production. In the context of African development, this process, which was described in *Great Transformations* by Polanyi (1944), may be identified with the transformation of land, labor, and capital into commercial commodities, particularly after the introduction of colonial rule. Although the onset of these transformations may have predated formal colonial rule in some parts of Africa and were probably autonomous, later changes during the colonial and post-colonial periods were either directly or indirectly the outcome of state intervention.

Historically, African agrarian systems have been characterized by relative abundance of land and critical seasonal scarcities of labor. The relative abundance of land, and the need to shift the location of farm plots in order to regenerate soil fertility naturally, implied less concern at the collective level with guaranteeing rights over specific pieces of land and instead emphasis upon control over large unutilized areas. It is still true of many areas today that individ-

uals gain use rights by initial clearing or inheritance and maintain such rights through continuous exploitation, making allowance for suitable fallow periods. Thus, households and individuals are able to claim perpetual interests in farming land and improvements in which they have invested labor or capital. These interests are inheritable and may be bequeathed to the next generation. Provided farmland is not under crops, it is also subject to secondary use (for example, for grazing) by members of the social group even though it is clearly not perceived to belong in the same category of common property as uncultivatable pasture land, forests, or fisheries. Although investment of labor or capital in land is often necessary to exclude others, the secondary right of exclusion is generally conditioned by the seasonality of farming operations. Agricultural intensification, which typically involves more continuous use of land, thus enhances the process of privatization of rights over land.

One implication of social determination of rights to land is that, even during long periods of absence, eligible individuals retain claims to land within the territorial areas occupied by their kinship or residential groups. The ability of African urban labor migrants to fall back on the kinship network as a source of security may have contributed to relatively low formal sector wages and poor job security for many urban workers, which in turn perpetuate the need to maintain claims over rural land. So long as land is abundant and the technology of production remains land extensive, claims of rights to rural land by absentee migrant workers need not result in production inefficiencies. But as land becomes scarce and absentee claimants seek to assert their rights through intermittent cultivation, it is likely that their plots would be farmed less intensively than others. However, this may not always be the case. By investing cash remittances from household members engaged in urban employment into agriculture, households with nonfarm income sources can experience higher levels of productivity.

The earliest individualization of a broad range of transfer and exclusion rights over land in Africa arose largely in response to the cultivation of commercial crops, primarily oil palm, cocoa, groundnuts, cotton and coffee (Hill 1963; Jones 1980; Moore 1986). After initial hesitation concerning the suitability of plantation farming, the colonial powers did not undertake any direct intervention to restructure indigenous land tenure arrangements in order to accommodate these developments, except where there was significant white settlement. In Angola, Kenya, Mozambique, eastern Zaire, and Zimbabwe, for instance, land tenure legislation was enacted to provide freehold rights to individual European farmers and corporations involved in plantation agriculture. In addition, as was the case in Kenya until the mid-1950s, cultivation of certain profitable crops by Africans was prohibited or severely restricted. This, combined with other policy instruments such as forced labor or the imposition of a head tax payable in cash, helped to guarantee cheap labor to white farmers.

Elsewhere, the most important policy support to agricultural commercialization, and unintentionally to the individualization of land rights, was the construction of communications and transportation infrastructure. Later, other in-

struments such as price support, credit, and extension were used with fairly significant results in promoting agricultural commercialization.

Based on the simplified sketch of the process of intensification as a result of the interplay between population pressure, technological changes, and agricultural commercialization outlined above, three broad categories of tenure regimes may be identified. At the earliest stage, characterized by the predominance of pastoral and sylvan economies, all land is communally owned, the group of authorized users is clearly defined, and there are rules specifying their rights and obligations with respect to the land and its resources. Following Feder and Feeny in this issue, we identify such regimes as common property and distinguish them from open-access, a regime of unrestricted privilege but no duties. The latter appears to represent the breakdown of rules governing group management of common property resources.

As population pressure increases, the period of fallow shortens and shifting cultivation is replaced by systems of rotation and soil improvement. These changes may also be precipitated by the introduction of commercial tree crop production, which tends to enhance rights of exclusion of individuals even though the basic control over outsiders' access to the land continues to be exercised by the community. Voluntary transfers of land to nonmembers are virtually nonexistent. It is prescribed that transfers are only to members of the landowning group and may be made only by bequests, gifts, or rent. But the latter two remain relatively rare, becoming significant mainly in areas of extreme land shortage or where there is high demand for land of particular types. Even then, prior approval may be required from leaders of the lineage or community.

As increased intensification leads to virtual exclusion by farmers of other individuals, there may be localized exchanges in productive factors leading to land or labor tenancies and credit markets. But only rarely do individuals acquire the untrammeled right of disposal of land. This partly relates to the significance of land as a source of security for *all* members of the lineage, even for those who spend extended periods working away. The distinguishing feature of different tenure regimes may thus be said to revolve around restrictions on the individual holder's ability to transfer land (only among family members, within the lineage or community, or to outsiders; and with or without approval from other lineage or community members), which also tends to coincide with the mode of transmittal (inheritance, gifts or bequests, and sale).

III. Land Rights, Population Pressure, Commercialization, and Agricultural Productivity: Empirical Evidence

The historical overview above suggests two key hypotheses that need to be tested. The first is that land rights do evolve toward full privatization in the presence of increasing commercialization and population pressure. The second is that as long as the evolution of land rights remains unrestricted, then, except

in short-run situations of dramatic economic or social change, indigenous land tenure systems are not likely to be a constraint on agricultural productivity.

Survey Profile

To test these hypotheses, we undertook farm surveys in 1987–88 in a total of ten regions in Ghana, Kenya, and Rwanda. Ghana was chosen to represent a situation of relative land abundance, whereas Rwanda represents a case of land scarcity. Within Ghana, we have chosen a highly commercialized shallot growing region with a dense, homogeneous population (Anloga), a land-abundant, cocoa-growing area with a significant migrant population (Wassa), and a land-abundant, food-growing area with a significant migrant population (Ejura). All three Rwandan regions are densely populated, and each produces a similar mix of crops (predominantly coffee, sorghum, and sweet potatoes). However, the commercial activity of farmers is noticeably greater in Ruhengeri than in either Butare or Gitarama.

We included Kenya in the survey because it is the only Sub-Saharan African country with more than thirty years of experience of a national land registration program and thus provides a test case for land tenure reform. Within Kenya, two traditional and densely populated African areas were chosen, the maize-producing region of Madzu and the commercialized area of Kianjogu (coffee). Two post-independence resettlement areas (where farmers received about five hectares of land) were also selected. Lumakanda exhibits more commercial activity than does the other resettlement area of Mweiga. Each of the ten regions is dominated by agriculture, and few off-farm income-earning opportunities exist.

More than 100 households were surveyed in each of the Ghanaian and Kenyan regions and about 80 in each of the Rwandan areas. Among the variables measured were characteristics of the household (for example, number, age, education, and occupation of all individuals, number of regular workers, nonfarm income, wealth, use of credit, and so on), characteristics of the household head (for example, farming experience, place of birth, office holding in local organizations), characteristics of the farm (for example, farm size and number of parcels), and characteristics of the parcels (mode of acquisition, soil fertility, parcel size, rights of transfer and use, land improvements made, type of document held, incidence of dispute, and, in the last season, the crops grown, inputs used, and output).

To provide an overview of tenure regimes predominant in our study regions, table 1 displays the percentage of parcels acquired under various methods. In the Rwandan regions and in Wassa and Ejura, numerous methods of acquisition are common. In Anloga and the Kenyan regions, nearly all parcels are acquired by three or fewer methods. The majority of parcels in all regions are acquired through nonmarket channels such as inheritance, gift, government allocation, and appropriation (initial clearing and use of part of the pool of communal land). Inheritance is by far the most common, whereas appropriation is becom-

ing rare as unused land disappears. Purchases of land are much less common but account for at least 17 percent of operated parcels in Madzu, Lumakanda, Wassa, and Ruhengeri. Markets for leaseholds (fixed rentals, sharecropping arrangements, and pledges[1]) are relatively rare in all regions except the Anloga region of Ghana. Although one would perhaps expect more land transactions, especially given that in many of the regions commercial crops are produced and land is relatively scarce, the lack of off-farm income opportunities greatly reduces the willingness of households to alienate land.

Effect of Population Pressure, Commercialization, and Government Intervention on the Individualization of Land Rights

Data were collected on whether a head of household could exercise numerous rights over particular parcels of land and whether, to exercise some of these rights, prior approval from another individual or institution was required.[2] The specific land rights enumerated for each parcel included use rights (rights to grow annual crops, to grow perennial crops, to be buried, to make permanent improvements, and to collect firewood, among others) and transfer rights (rights to lend, rent, pledge, mortgage, give, bequeath, and sell). The first three rows of table 2 categorize land parcels according to the breadth of accompanying transfer rights. The first group, "limited transfer" land, includes those parcels for which the farmer has no permanent transfer or alienation rights, but may have some temporary transfer privileges. Second, the "preferential transfer" category describes parcels that may be permanently transferred but only within the family or lineage (that is, through gift or bequest). Third, "complete transfer" lands are those that may be alienated outside the lineage through the right to sell.[3] This simple classification scheme produced mutually exclusive groups, each comprising parcels which were very homogeneous with respect to the breadth of rights, with more land rights found on "complete transfer" parcels.

The data in table 2 provide the basis for simple tests of the effect of population pressure and agricultural commercialization on the individualization of land rights. The effect of population pressure is best tested by comparing regions in Ghana. Although each Ghanaian region is fairly commercialized (Anloga, shallots; Wassa, cocoa; Ejura, large food crop farms), only Anloga experiences high population pressure. From the sum of the fifth and sixth rows of table 2, we see that for permanently held land, the percentage of "complete transfer" parcels is 82.5 percent in Ejura, 76.7 percent in Anloga, and 70.3 percent in Wassa. If the necessity of approval is also taken into account, however, the results change

1. Pledges are possessory mortgages in which the lender of cash takes possession of the land for a specified period and earns, as interest, the proceeds from the land.

2. Farmers' perceptions about who they must clear land transfers with often do not correspond with legal requirements, but the data we report here are respondents' perceptions of their rights.

3. There may still be restrictions on transferring land to members from other tribes or cultural groups, but these are much less constraining than restrictions on other transfers at the family or immediate lineage level.

Table 1. *Methods of Acquisition of Operated Parcels in the Study Regions*
(percent)

	Ghana			Rwanda			Kenya			
Mode of acquisition	*Anloga*	*Wassa*	*Ejura*	*Ruhengeri*	*Butare*	*Gitarama*	*Madzu*	*Luma-Kanda*	*Kianjogu*	*Mweiga*
Purchased	0.9	18.0	6.3	17.4	3.2	8.1	28.6	26.0	13.2	6.0
Inherited	57.5	6.3	22.1	46.6	43.4	49.5	68.3	31.3	82.1	35.0
Given	0.8	44.2	43.1	8.3	5.6	4.1	0.0	0.0	0.0	1.0
Appropriated	0.0	22.1	14.7	0.5	3.7	1.5	0.0	0.0	0.0	0.0
Allocated from government	0.0	0.0	0.0	4.0	4.9	15.6	0.0	33.6	1.9	58.0
Other permanent acquisitions	0.0	1.7	0.4	6.3	4.1	0.2	0.8	1.6	0.0	0.0
Rented	21.5	7.0	9.6	7.4	15.7	7.9	1.5	7.6	1.9	0.0
Pledged	19.3	0.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Borrowed	0.0	0.1	0.0	9.5	19.4	13.2	0.8	0.0	0.9	0.0
Squatter land	0.0	0.0	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: World Bank data, available for a nominal reproduction charge upon written request to the author.

Table 2. *The Prevalence of Land Rights across Study Regions*
(percent)

	Ghana			*Rwanda*			*Kenya*			
Land right	*Anloga*	*Wassa*	*Ejura*	*Ruhengeri*	*Butare*	*Gitarama*	*Madzu*	*Luma-Kanda*	*Kianjogu*	*Mweiga*
All parcels										
Limited transfer	52.4	6.0	21.0	15.5	36.7	21.1	26.2	9.9	23.6	53.0
Preferential transfer	2.1	29.1	6.6	3.1	16.5	21.3	6.3	14.5	67.9	10.0
Complete transfer	45.4	64.9	72.4	81.5	46.7	57.6	67.5	75.6	8.5	37.0
Permanently held parcels										
No right to sell	23.3	29.7	17.5	2.4	28.2	22.4	30.9	18.2	91.3	63.0
Right to sell with approval	14.0	55.6	73.5	19.7	37.3	10.6	39.0	51.2	4.9	4.0
Right to sell without approval	62.7	14.7	9.0	77.8	34.5	67.0	30.1	30.6	3.9	33.0

Source: World Bank data, available for a nominal reproduction charge upon written request to the author.

considerably. The percentage of permanently held parcels which may be sold without approval is much higher in Anloga (62.7 percent) than in either Wassa (14.7 percent) or Ejura (9.0 percent). If the ability to transfer land without approval is indeed the paramount measure of the individualization of land rights, then the Ghanaian data strongly support the notion that increased population pressure brings forth a higher degree of privatization of land rights.

Our best basis for testing the effect of commercialization on the privatization of land rights is Rwanda. In Rwanda, each of the three regions is characterized by high population density, but Ruhengeri is the most commercialized and Butare is the least. In Ruhengeri, 97.5 percent of permanently held parcels are "complete transfer" lands as opposed to 77.6 percent in Gitarama and 71.8 percent in Butare. If approval to sell is considered, the Butare region exhibits by far the lowest percentage of freely saleable parcels. These patterns provide support for the argument that increased commercialization hastens the individualization of land rights.

Our Kenyan regions do not provide the basis for such controlled tests. Madzu and Kianjogu differ somewhat both in population density and in degree of commercialization, with Madzu being denser and less commercialized.[4] Because land rights are more individualized in Madzu, if all else were equal, it suggests that population pressure may have been more influential than commercialization on land rights.

The Kenyan regions of Madzu and Kianjogu can also be used to test the effectiveness of government land policies, in this case a land registration and titling program, on the individualization of land rights. Of the 97 parcels with land titles in the two regions, only 23 can be sold by the current operator (23.7 percent) and only 24.5 percent of 94 parcels which may be sold are also titled. The apparent persistence of indigenous control over land transfers demonstrates the difficulty in altering custom by government decree. Another example of the ineffectiveness of government intervention is in Rwanda, where despite laws forbidding land sales without government authorization, farmers claim the right of sale over most of the sampled parcels.

Land Rights and Agricultural Productivity

Following Feder and others (1988), the relationship between land rights and productivity is hypothesized to proceed as follows. Increased individualization of rights improves farmers' abilities to reap returns from investments on land. This leads to a greater demand for land improvements as well as for complementary inputs. Increased individualization of rights may also improve the creditworthiness of the farmer and enhance his chances of receiving formal credit. Both of these demand- and supply-side mechanisms interact to increase investments in land and input use, which in turn lead to greater land productivity.

4. The Lumakanda and Mweiga regions are less useful for testing purposes because they have been settled only since the 1960s, and thus sufficient time has not passed to evaluate the evolution of land rights.

Table 3. *Aspects of Credit Markets in the Study Regions*

Country and region	Percentage of households receiving: Any credit	Formal credit	Formal sector loans: Number	Percent secured with land
Ghana				
Anloga	47.8	37.4	43	19.5[a]
Wassa	22.0	12.7	19	26.3
Ejura	5.7	4.4	7	0.0
Rwanda				
Ruhengeri	41.0	0.0	0	n.a.
Butare	12.7	0.0	0	n.a.
Gitarama	13.8	8.8	12	41.7
Kenya				
Madzu	—	4.0	5	50.0[a]
Lumakanda	—	10.7	13	69.2
Kianjogu	—	8.7	9	0.0
Mweiga	—	1.0	1	100.0

— Not available.
n.a. Not applicable.
Note: The figures for Ghana are for 1987; for Rwanda and Kenya, they represent the 1987–88 period.
a. The type of collateral was not reported by the respondents for all loans.
Source: World Bank data, available for a nominal reproduction charge upon written request to the author.

Credit. The use of formal credit is limited in the study regions, reflecting the poor development of formal rural banking institutions. Table 3 shows that less than 13 percent of the farms received formal credit during 1987–88 in nine of the ten study regions. The Anloga region of Ghana was the only exception—37.4 percent of households received formal credit there. Furthermore, in Ghana and Rwanda, all formal credit loans were short-term, none being extended for more than one year. It is therefore not surprising to find a weak relationship between land rights and the use of formal credit. For instance, we did not find any significant relationships between the use of formal credit and the proportion of land held with "complete transfer" rights.

Given the low incidence of formal borrowing, the absolute number of cases in which land is used to secure loans is very low (see table 3), and in fact none were reported in four of the regions. Group loans, where a group of borrowers is jointly responsible for repayment in lieu of collateral, are common in obtaining formal credit in Anloga. In each region, loan maturities averaged under one year. Although this may be partly influenced by lack of formal collateral, it is characteristic of banks not to favor long-term lending.

The case of Kenya differs considerably from that of Ghana or Rwanda in that formal titles to land are held by many farmers and could be obtained by countless others. However, we did not find a significant relationship between the possession of title and use of formal credit. The use of land titles also did not imply an increase in loan maturity or loan size. For instance, among all formal

sector loans, the average maturity of loans secured by land was 24.1 months, but those secured by other means (cosignatory, group guaranty, and agricultural produce) averaged 31.5 months in length (the difference is not statistically significant). In light of these findings, we conclude that there is little relation between land rights or land title and the use of formal credit. The low incidence of formal credit in Kenya also suggests that land titles alone will not lead to the development of active rural credit markets.

Land improvements. In terms of their effect on investment in land improvements, land rights have mixed results.[5] The ability to bequeath land is the important distinguishing right in each Rwandan prefecture. Parcels which cannot be bequeathed ("limited transfer" parcels) are much less likely to be improved by farmers in any manner or with long-term investments.[6] For example, 78.7 percent of parcels which may be bequeathed were improved as opposed to 26.7 percent for those which could not be bequeathed. Among permanently held parcels, there is no difference in the incidence of land improvements between "preferential transfer" and "complete transfer" land, nor does the requirement of prior approval matter. In Anloga (only permanently held parcels were surveyed for investments), 61.8 percent of "complete transfer" parcels were improved (by drainage, mulching, or excavation) as opposed to only 5.4 percent of "limited transfer" parcels. Moreover, the parcels which could be transferred freely were more likely to have been improved than those requiring prior approval. In Ejura and in Wassa, the incidence of investment was not related to land rights. A lack of relationship was also found for each Kenyan region. From these varied findings, it is not possible to make any general assertions regarding the effect of land rights on land improvements.[7]

Productivity. To test the relationship between land rights and land productivity, we estimated reduced-form yield equations using parcel level data for selected crops.[8]

In general form, the equation is: $Y = f(X_h, X_p, S) + e$, where Y = yield, measured as the gross value per hectare of all crops harvested on the parcel; X_h = a vector of household characteristics (to capture resource and skill levels); X_p

5. In Rwanda, numerous types of land improvements were classified as either boundary, short-term, or long-term. In Kenya, only terracing, drainage, and tree crop improvements were examined. In Anloga, the improvements were drainage, mulching, and excavation. In Wassa, the only improvements made by farmers were tree crops. Finally, in Ejura, tree crops and destumping investments were analyzed.

6. The difference is most marked when the improvements made by the current operators are compared. But land that cannot be bequeathed by the current operators also has less accumulation of improvements, irrespective of who made them.

7. For a more sophisticated analysis of these relationships, see Place, Hazell, and Lau (1990).

8. Yield regressions were confined to the more important crops in each region, and we tried to avoid crops that were extensively intercropped. Production was physically measured at harvest in Rwanda but was obtained by farmer recall elsewhere. Because the major crops were mostly cash crops (for example, cocoa and shallots in Ghana), farmers also had less trouble recalling the amounts produced.

= a vector of parcel characteristics (to capture size and land quality differences); S = a set of dummy variables for the land rights categories; and e = an error term.

In estimating this equation, we need to be sure that X_p and the land rights S are not correlated with the error term; otherwise the estimated coefficients would be biased and inconsistent. There are two possibilities to worry about. The first is that the choice of land parcels (and hence X_p and S) are determined simultaneously with yields. Given that most parcels were acquired many years ago and that transfer rights, which are the basis of our land rights categories, are virtually predetermined by the mode of acquisition,[9] there is little argument for a causal relationship from Y to S or X_p. It is more appropriate to view farmers' decisions as recursive; first they select parcels and then they farm them.

A more worrying possibility is that there may be unobservable variables which affect both the choice of parcels and current yields, even though decisions are made at different points in time (this will lead to the collapse of the recursive framework). These unobservables may be household effects (for example, managerial skill) or parcel effects (for example, quality of soil).

Because we have several parcel observations for each household, we are able to correct for unobservable household effects using either dummy variables (fixed household effects) or an error components model. Unfortunately, we do not have multiple observations on each parcel and cannot treat parcel effects in the same way. But we are able to control for a number of parcel characteristics, including soil fertility, which are included in X_p. Given the numerous observable parcel quality controls, it is doubtful that unobservable parcel quality is significant in either the determination of yields or the choice of land rights and X_p.[10]

We found no relationship between land rights and parcel yields in Kenya and Ghana (see table 4). This is true in both the fixed effects (where feasible) and error component models. In additional regressions, we also found that the mode of acquisition had no effect on parcel yields. But this is to be expected because there are strong correlations between the mode of acquisition and the land rights held.

In Gitarama and the pooled Rwandan sample, we found that 'short-term use rights'[11] parcels were more productive than parcels in all other land rights categories. This perverse result can be explained as a multicollinearity problem. Land rights categories are highly related to the year of acquisition in Rwanda, primarily because 'short-term use rights' parcels are almost always rented and

9. Although not reported here, cross-tabulations of land rights categories against mode of acquisition show a high correlation. This is not to deny that land rights evolve over time, but the changes probably occur when land changes hands. Moreover, evolutionary changes will not quickly lead to the reclassification of parcels from one of our broad land rights categories to another.

10. We also find no evidence of any relationship between parcel quality variables and the land rights categories.

11. "Short-term use rights" parcels are those "limited transfer" parcels whose use rights are restricted to a specified number of seasons (mainly rented parcels).

Table 4. *Summary of Parcel Yield Regression Results*

Regional regression	*Preferential transfer*	*Complete transfer*	*Complete transfer with approval*	*Complete transfer without approval*	*Other*
Ghana					
Error component					
Anloga			−0.348	−0.012	
Wassa			0.211	−0.106	
Ejura	0.441	−0.082			
Fixed dummy					
Ejura	0.302	−0.196			
Rwanda[a]					*Long-term use rights*
Error component					
Pooled Rwanda	−0.210	−0.362**			−0.234*
Ruhengeri		−0.148			
Butare	−0.236	−0.319			−0.285
Gitarama	0.001	−0.683**			
Fixed dummy					
Pooled Rwanda	−0.306	−0.527**			−0.320*
Ruhengeri		−0.122			
Butare	−0.327	−0.382			−0.344
Gitarama	0.156	−0.847**			
Kenya					*Land title*[b]
Error component					
Madzu			0.146	0.051	0.283
Lumakanda			−0.134	−0.149	−0.142
Kianjogu	0.127	0.337			0.155
Mweiga	0.580	0.223			−0.167

*Significant at a 10 percent level.

**Significant at a 5 percent level.

Note: The most limited land rights group (that is, "limited transfer rights") is omitted from the regression and is the base against which all included land rights variables are compared.

Other explanatory variables included in the regressions but not reported here are (1) parcel characteristics: size, fertility, topographical location, slope, distance to house, year acquired, prior improvements, documents held, and cropping pattern; (2) household characteristics: age, education, occupation, gender, and farming experience of the household head; (3) farm characteristics: size, level of fragmentation, wealth, size of household, and nonfarm income; village where household resides.

a. The Rwandan results are from the model containing the years since acquisition variable. See the text for a discussion of the results for the land rights variables once years since acquisition is removed.

b. The land title coefficients are from separate regressions which exclude the land rights variables.

Source: World Bank data, available for a nominal reproduction charge upon written request to the author.

hence have been held for much less time than parcels acquired under other modes. Moreover, the time since acquisition variable is positively and significantly related to yield, and when this variable is dropped in a separate regression, the results show that the more secure land rights categories are no longer significantly less productive than 'short-term use rights' parcels. The negative but insignificant coefficients remain, but they might be explained by differences in households who rent in land. Farmers who rent in land may generally be in

dire need of land resources and apply greater amounts of labor in order to provide subsistence for their families.

We also tested the effect of land title on productivity in Kenya by including it alongside the land rights variables and by itself in separate regressions. In all cases, the possession of land title was not significantly related to yields. This is likely explained by the limited use of credit in the Kenyan study regions.

IV. Impact of Recent Government Interventions in Land Tenure

Individual Tenure

Perhaps the most comprehensive case of land tenure change aimed at establishing alienable individual rights is that initiated in Kenya during the 1950s and continued to the present date with some modifications. Although there is agreement that Kenya has enjoyed among the highest productivity increases in Africa during this period, the causal relationships between individual tenure and increased agricultural output have been seriously questioned. Many believe that the removal of prohibitions against Africans to produce high value commodities (tea, coffee, and dairy products), coupled with substantial investment in communication and transport infrastructure during the 1950s and 1960s, improvements in extension services, and establishment of credit institutions, have been more important than changes in land tenure arrangements (Heyer, Maihta, and Senga 1976; Anthony and others 1979; Migot-Adholla 1985). Indeed, this appears plausible when account is taken of the substantial increase in the production of these crops (cocoa, coffee, tea, and oil palm) in countries such as Cameroon, Côte d'Ivoire, and Ghana, which have not undertaken any fundamental legal tenure change.

Critics of the Kenyan tenure reform have faulted it on grounds of increased landlessness. It should be realized, though, that an important objective of the program was concentration of land in the hands of the more efficient producers (Swynnerton 1954). Given Kenya's failure to industrialize and its very limited land resources, the current level of landlessness is as much a product of the exceptionally high rates of population growth as it is a reflection of the existing land tenure system.

Paradoxically, one consequence of the emergence of the nation-state in Africa, and particularly colonial and post-colonial reinterpretations of tribal authority and "indigenous" tenure, has been the freezing of ethnic boundaries, which has restricted opportunities for expansion of extensive land use. Where marginal land has already been utilized, output may be increased only by intensification. In such situations, we have argued that individualized transferable rights of land use will have evolved, even without introduction of formal registration.

But given the centrality of ethnicity in national politics, it is inconceivable that a national land market would evolve merely as a result of the introduction of privatized tenure system. Evidence from other studies of Kenya indicates that although there is a weak market in land nationally, it is more severely restricted

in the former African reserve (Non-Scheduled Areas), where it operates mainly among members of the same ethnic group. In contrast, a significant level of transactions in land occurs in the former white settled (Scheduled) areas and in urban peripheries, where individuals are not bound by strong kinship identity. The consequence is that titles to agricultural land are perceived to have a greater commercial value within the urban periphery and former scheduled areas, than in the former African reserves, largely because of difficulties in enforcing contracts. For although some banks have accepted titled land as collateral and auctioned it off in cases of default, in some cases purchasers were not able to take occupation of the land for fear of reprisals. Thus, rather than stimulating a land market in which more efficient farmers acquired land, this situation had created a market in land titles which were often used to secure loans for non-agricultural investment (Okoth-Ogendo 1986). But this development has been complicated even further by recent legislative amendments which require that disputes over land be referred to elders in the first instance—a condition which underlines official ambivalence with respect to full implementation of the provisions of the Registered Land Act for fear of promoting dispossession of poor and indigent peasants by their richer neighbors.

More generally, our results on credit access and productivity, as well as those from parallel studies undertaken by the Land Tenure Center of the University of Wisconsin (1990), suggest that large-scale land registration and titling programs are unlikely to be economically worthwhile for much of Sub-Saharan Africa at this stage of its economic development. But there are circumstances when titling might be worthwhile, for example:

- When the indigenous tenure systems are absent or very weak: this is frequently the case in land settlement areas, but it can also arise elsewhere following periods of major economic or political upheaval, particularly if traditional lines of authority have been severed
- In areas where the incidence of land disputes is high: this may occur in areas where large numbers of migrants or strangers have settled and established rival claims to land owned by indigenous groups
- Where major project interventions are planned that either require full privatization of land rights for their success, or are likely to weaken the land rights of some vulnerable groups: some irrigation and tree crop projects provide good examples.

Where tenure reform through land registration is to be undertaken, it is important to recognize the possibly overlapping rights of different individuals on the same piece of land. For example, herdsmen may have dry-season grazing rights on land that is cropped by others. If some of these rights are lost without adequate compensation, vulnerable groups may lose an important source of livelihood. The rights of access to land by all lineage members, even when working or resident elsewhere, has also been shown to provide an important element of security, particularly in old age, as well as being an important factor

in explaining the low incidence of landlessness in many heavily populated rural areas of Sub-Saharan Africa. Again, loss of these rights without adequate compensation could prove economically disastrous for some vulnerable groups. Land registration programs that attempt to record and protect the full range of customary rights run the risk of ossifying land tenure institutions and reducing their ability to evolve with economic circumstances. Where titling is required, it seems better to seek full privatization of land rights but within the context of an adequate system of compensation for those who lose some or all of their rights over land.

Strengthening Indigenous Land Tenure

The indigenous land tenure systems appear to be adapting efficiently to changes in relative factor scarcities. This is reflected in the emergence of markets for the sale and rental of land, and in the trend toward increased privatization of land rights. For this process to continue, it is important that governments not impose unnecessary restrictions on the ownership or transfer of land. For example, restrictions on land sales and rentals are often legislated in the belief that this will prevent excessive concentration of land amongst the rich and the dispossession of the poor. In practice, this concern is rarely justified, and it might anyway be more easily addressed through farm-size ceilings without inhibiting land markets and preventing more efficient allocations of land between farmers with different management skills or factor endowments. Some governments (for example, those of Botswana, Nigeria, and Swaziland) are also unnecessarily restricting land transactions through policies that seek to "retribalize" land in the pursuit of rather nostalgic idealizations of African rural society (Cohen 1980; Bruce 1988).

Rather than restricting land markets, governments should create an "enabling" legal and institutional environment for more efficient transactions. This might entail establishing a voluntary system to simply record the details of land transactions and the interests of the different parties, and providing or reinforcing channels for the enforcement of all duly recorded contractual arrangements. These kinds of interventions could go a long way toward resolving many of the disputes that arise over land, particularly in areas where significant migrant or stranger farmers have settled, yet would be much cheaper than formal registration and titling programs.

V. CONCLUSION

We have argued that the contrast between indigenous African tenure and Western property rights systems should be perceived not in terms of opposite extremes but as points along a continuum between communal rights systems and privatized rights systems. In response to population pressure, agricultural commercialization, and technological change, indigenous African tenure systems have moved along that continuum in the direction of greater individualization of

land rights. This conclusion is supported not only by historical evidence, but also by our cross-sectional study of land rights in Ghana, Kenya, and Rwanda.

Controlling for differences in land quality and household characteristics, our regression analysis indicates no relationship between cross-sectional variations in land rights and productivity. Thus, it undermines the conventional view that land rights are a constraint on productivity.

Our study also indicates that land titling is not sufficient to increase access to formal credit; land as collateral is of little value in the study areas of Kenya, primarily because land transfers to outsiders through sale (or foreclosure) are not always recognized as legitimate. Moreover, in the absence of better nonfarm opportunities, farmers are reluctant to mortgage land.

We are unable to determine precisely the degree of efficiency with which indigenous systems in our study regions have evolved. We do find some success stories associated with indigenous tenure systems: multiple cropping and high use of inputs in Anloga, adoption of cocoa production in Wassa, use of mechanization in Ejura, and adoption of some high-yielding varieties and soil conservation improvements in Rwanda. However, it is difficult to judge whether the pace of these changes could have been hastened by government intervention in land tenure arrangements. Evidence from Boserup (1981) and Pingali and others (1987) suggests that without accompanying improvements in infrastructure, rural health and education, and price incentives, the rate of change in agricultural intensification and technological change would be constrained under any tenure regime.

Needless to say, our results are subject to some qualifications. The most important is that our study regions are, like much of Sub-Saharan Africa, poorly endowed with physical infrastructure and effective credit and marketing institutions. Factor markets for land, labor, and capital are also poorly developed and the available technologies have mostly been stagnant for quite some time. Within this context, one should not expect to find much new investment in land improvements or much use of modern inputs, even when full land rights are assured. Not only will the demand for investments and modern inputs be muted, but even where it exists, it may not be realized because of failures on the supply side for credit and inputs. As new technologies become available, credit, input, and product markets improve, and rural infrastructure is developed, then more significant relationships between tenure security and land productivity may begin to emerge.

A second limitation of the study is that we covered only areas of rainfed agriculture. Questions remain about the suitability of indigenous land rights for irrigated farming, extensive pastoral and livestock systems, and communal forestry areas.

A third, more subtle limitation of our argument is that it extrapolates from past performance of indigenous land rights to future evolution. These systems are predicated on the solidarity of small-scale social entities. These entitles may cease to function if national institutions or national and international mobility

of labor destroy their legitimacy, or if loyalties to lineage and communal groups become weak.

Given the wide variety of African rural economies and politics and differences in resource endowments, a pragmatic approach that promotes the adaptability of existing land tenure institutions appears preferable to radical reform either of an individualist or collectivist type. But this is not to argue for the reinvention of an idealized African past. Rather, it suggests intervention only where demand for change has been proved genuine. In the case of land registration, such a demand should arise following increased commercial agricultural opportunities and the acceptance of the legitimacy of impersonal forms of land transfers. In the meantime, governments have much to do in providing rural infrastructure, promoting market efficiency, and disseminating information about production technology, which are the real constraints on agricultural productivity.

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Introduction: Poverty and Adjustment in the 1980s

Lyn Squire

One of the most important debates of the 1980s has centered on the impact of structural adjustment programs on the poor. Some argue that the poor suffered severely during the 1980s and that much of their suffering can be attributed to adjustment. Others hold that declining standards of living were experienced by some, but certainly not all or even most, of the poor and that without adjustment the extent and depth of suffering would have been greater.

The debate encompasses two distinct questions: what happened to the poor during the 1980s and have adjustment policies intensified poverty? The first question is factual, and the answer lies in a careful analysis of available information. But, to answer the second question, one must be able to develop a credible outline of what would have happened without adjustment; that is, an appropriate counterfactual situation has to be developed. The articles in this issue address both questions.

I. What Happened to the Poor during the 1980s?

Although analysis of *how* the welfare of the poor has changed in the 1980s is simpler than determining *why* the changes occurred, it is complicated by problems of definition, data availability, the unit of analysis, and method of measurement. These problems of measurement are addressed comprehensively in the January 1991 issue of *The World Bank Economic Review.*

There are four major measurement issues that must be addressed. First, while a policymaker's objective may be to ensure some minimal level of welfare for all citizens, highly contentious political and ethical issues are involved in selecting the particular aspects of well-being to be considered and their acceptable minimal level. (The wide differences in results of "apparent prosperity measures" derived from intensive field work and "current and permanent income" classifications are illustrated in Lanjouw and Stern 1991.)

Second, data problems are pervasive in analyzing living standards. Several elements of well-being are qualitative and resist measurement. Even when

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clearly quantitative indicators are considered, comparable and reliable tim ries data are seldom available in developing, and often even in indus countries.

Third, the unit of analysis may be based on residence, household, sh expenditures, family, or individual, and the resulting measurement of po will depend on the distribution of welfare among the members of the unit the equivalence scale used to account for differences in the number of men across units (the difficulties and differences even in studies with relatively a data are illustrated in Atkinson 1991).

Finally, issues of aggregation and weighting will impinge on measure within and across sectors, regions, and periods. If the utility of income dec with increases in its level and if some minimum threshold of income or consu tion is needed for survival, even a similar absolute reduction in income instance) may hurt the very poor more than the relatively poor. But how sh the changes in the income of the very poor and the less poor be weighted? degree of poverty is reflected in measures of the poverty gap applie Ravallion and Huppi [1991] in their decomposition of changes in pover Indonesia.)

The *World Development Report 1990* (World Bank 1990) argued that being is a product of a range of factors, including adequate consumptio goods and services, health, status, achievement, and security. Because mo those factors can be attained in the market, available income will gene determine access to them and thus is the most commonly used measure of being.

The *World Development Report 1990* demonstrated that sustained incre in the incomes of the poor require broadly based economic growth. Since distribution of income changes only slowly, most observed reductions in pov are primarily a consequence of increases in average income. The great maj of the poor are found in South and East Asia (520 and 280 million pe respectively, in 1985), regions that sustained annual growth in per capita g domestic product (GDP) of 2.8 and 7.0 percent, respectively, from 1980 to 1 Sub-Saharan Africa and Latin America, with 180 and 70 million poor, res tively, experienced *declines* of 2.4 and 0.7 percent during the same pe (World Bank 1990, table 2.1 and indicator tables 2 and 26). These data sug that the majority of the world's poor—those in Asia—may have benefited f broadly based economic growth during the 1980s. In Sub-Saharan Africa Latin America, however, the 1980s can be aptly labeled "a lost decade," indeed much of the debate has focused on these regions. Analysis of those (countries with reliable data drawn from household surveys confirms this gen picture.

Such data are available throughout the 1980s for Hungary, Poland, Yugoslavia. Milanovic shows that with the distribution of income remai more or less unchanged, poverty moved in line with average income—increa in Poland and Yugoslavia and remaining roughly constant in Hungary.

developments stand out in the Polish and Yugoslavian experience. First, poverty became an increasingly urban phenomenon. And second, the increase in poverty was associated with a decline in real wages rather than an increase in unemployment.

In these countries an explicit choice was made to try to distribute the social costs of adverse economic developments more evenly by allowing decreases in real wages rather than increasing unemployment. The extent of public employment made such a policy feasible. But in most countries this is not an option, and the ultimate impact on poverty, especially in urban areas, will depend on the flexibility and responsiveness of the labor market.

This point emerges clearly from Pissarides' analysis of developed countries. Despite the presence of social insurance, poverty increased during economic recession mainly because of increased unemployment in Australia and the United Kingdom and mainly because of lower wages among unskilled and low-skilled workers in the United States. Pissarides' study also shows that, unlike the other industrial countries in his sample, the impact of recession on the poor in Sweden has been much less severe, apparently reflecting the combination of limited-duration unemployment insurance and a public sector job guarantee. This, it is claimed, provides protection but minimizes adverse effects on incentives because one cannot receive unemployment benefits indefinitely. Most countries in the developing world are not able to administer or finance such systems, but the basic principle underlies public employment schemes such as the Maharashtra State Employment Guarantee Scheme in India.

The general relation between growth (or decline) and poverty notwithstanding, it is still possible for the poor to suffer a decline in well-being even when average incomes are rising. According to Ahmad and Wang this seems to have happened in China. China undertook systemic policy reform in 1979–83, especially in rural areas. Because the system of reporting changed in 1984, data for the pre-and post-1984 periods are not strictly comparable. The evidence suggests, nonetheless, that between 1978 and 1988 real average per capita net income for rural residents approximately doubled, and real average per capita expenditure for urban residents may also have almost doubled. The dramatic improvement in average personal income was reflected in a significant decline in the incidence of poverty in rural areas through 1983, but this trend was partially reversed thereafter. From 1981 to 1984 the incidence of poverty declined significantly in urban areas. Although urban poverty was also lower in 1988 than in 1985, the trend rose after 1986. Ahmad and Wang attribute these setbacks to a combination of the dismantling of some aspects of the system of social security and services, on the one hand, and stagnation in agricultural production and accelerated inflation, on the other hand. The poor were rendered more susceptible to adverse economic events.

Without household surveys the analyst is forced to rely on approximate indicators of the income of the poor. In their analysis of five Sub-Saharan African countries, for example, Sahn and Sarris look at the effect of changes in relative

prices on the incomes and expenditures of the poor, assuming that production and consumption behavior remains unchanged. This has the obvious advantage of requiring information only on changes in prices (which is relatively easy to collect) and on the initial distribution of sources of income and pattern of expenditures (a more difficult undertaking). The empirical gains, however, come at a cost; when prices increase, for example, improvements in the well-being of net producers will not account for resulting increases in production and thus will be underestimates. Similarly, losses suffered by net consumers will be overestimated because substitution into competing goods will not be reflected. Nevertheless, given that most countries lack time series data on income distribution, the Sahn-Sarris approach provides a framework for examining the direct effect of changes in key prices as well as the indirect effect of adjustment policies more broadly through changes in wage rates.

While acknowledging these qualifications, Sahn and Sarris conclude that "there is little evidence of large welfare gains or losses" for the poor arising from the changes in relative prices witnessed in the 1980s in their five countries despite the overall decline in average incomes noted above. The article focuses, however, on rural smallholders. Although most of Africa's poor are in this group, it leaves open the question of what happened to the urban poor. One inference to be drawn from this article is that much of the burden of adjustment in Africa falls on those, including the poor, in urban areas.

A key conclusion of the *World Development Report 1990* is that economic growth does not translate automatically into comparable improvements in such nonincome measures of the poor's well-being as life expectancy, primary school enrollment, and so on. By the same argument it might be expected that temporary economic decline is not necessarily associated with a reversal in social progress. And yet much of the debate has focused on the issue of the poor's access to basic social services during the 1980s.

Behrman and Deolalikar focus on this issue in their analysis of the Jamaican structural adjustment program. They ask whether selected measures of well-being deteriorated significantly during 1984 and 1985, years of intense economic adjustment. They estimate the secular trend for each variable of interest and test for a statistically significant deviation from that trend in 1984 and 1985. By focusing on departures from trend, this method avoids the undue reliance on changes in levels that has often characterized previous studies.

Their general conclusion is that, when viewed as departures from trend, the changes observed in Jamaica in 1984 and 1985 are much less significant than has been suggested by other researchers, who focused on changes in level. For example, they find no evidence of significant deviations in a range of measures related to educational and health outcomes but do detect some nutritional deterioration among small children. Although there are clearly questions of the short- versus long-term sensitivity of well-being that cannot be addressed in this brief time frame, the value of their contribution lies in its emphasis on careful empirical investigation and interpretation.

The articles in this issue do not provide a definitive answer to the question of how poverty changed in the 1980s, but they do suggest that, as more careful empirical analysis becomes available, some of the more extreme views of the 1980s will have to be modified. They also point to some important insights and suggestions for future work. First and foremost, the quality and reliability of data related to poverty needs to be improved. The value of household surveys is revealed in Milanovic's study of Eastern Europe and Ahmad and Wang's analysis of China. This suggests the importance of improving the capacity of countries to undertake periodic surveys of living standards. Second, for many countries, and obviously for historical analysis, simpler approaches will be required. The articles by Sahn and Sarris and by Behrman and Deolalikar point to the variables that are most likely to be correlated with poverty and that could form the basis for analysis in data-scarce countries. Third, and consequently, empirical confirmation of the assumptions underlying these two articles would be an important contribution. In particular, can existing household surveys be used to test the Sahn-Sarris assumption that changes in producer and consumer behavior can be ignored in the short run so that the analyst can legitimately focus on changes in prices? Similarly, is the Behrman-Deolalikar reliance on such nationwide indicators as infant mortality appropriate for assessing changes in the well-being of the poor?

II. Have Structural Adjustment Policies Intensified Poverty?

Those who wish to tackle the second question must confront not only the absence of reliable data but also the need to specify what would have happened had the adjustment policies under consideration not been pursued. The need to compare results with an appropriate counterfactual applies to all analysis of economic policy, but it has often been forgotten in the debate on adjustment. In this respect Sahn and Sarris are careful to stress that their analysis of prices and poverty says nothing about adjustment policies precisely because they do not analyze what prices would have been without adjustment. Similarly, Behrman and Deolalikar's analysis of departures from trend says nothing about adjustment policies unless it is argued that the trend would have indeed continued had adjustment policies not been implemented, a slim possibility considering the untenable economic conditions of the period.

Among the policies commonly adopted in structural adjustment programs is devaluation of the domestic currency and reduction of disincentives to international trade. This is intended to increase foreign exchange earnings (improving the current account balance) and the perceived creditworthiness of the country (increasing capital inflows) and to induce a more efficient allocation of resources domestically to reflect the comparative advantage of the country. What is not known is whether these policies entail lower levels of welfare for the poor in the short run compared with a continuation of the existing policy regime or some other package of policies.

Reform of fiscal (and related monetary) policies raises the same issue. Clea these programs can reduce welfare in the short run, but in most cases they we preceded by declines in terms of trade and external finance, increasing de service costs, and unsustainable growth in external and fiscal deficits and infl tion. Thus any analysis of the effects of structural adjustment on poverty mu compare the outcome not with the preceding period, but with the outcomes th could be expected from alternative policies that would have been economical and politically feasible under the difficult conditions of the 1980s.

By stressing the importance of what would have happened without adjus ment, the issue is correctly posed as one of choosing among alternatives. Bou guignon provides a simple framework for exploring options following a negati external shock. His analysis captures the key elements of the long-run strate set out in the *World Development Report 1990* and places them in the context a short-run economic crisis. The report demonstrated that poverty had bee reduced most successfully in countries that both pursued growth that creat productive opportunities for labor (thus increasing the most important ass owned by the poor) and invested in the human capital of the poor (thus increa ing their capacity to benefit from the opportunities arising from econom growth). It argued that with this two-part strategy the poor not only benefit from growth but also contributed to it.

The report also recognized the need for a "safety net" to protect the po during adverse circumstances arising from, for example, a major external shoc This is the starting point for Bourguignon's analysis. A permanent deterioratic in the terms of trade that reduces income throughout the economy also raises tl marginal value of income to the poor, thus increasing the social value of incon transfers to them. But the marginal value of investment also increases becau the structural adjustment that is now required realistically can only take pla through new investment. The tradeoff between the use of limited resources f these two options is the fundamental dilemma confronting the policymaker.

Bourguignon explores this dilemma. He first asks, should resources be tran ferred to the poor immediately following the shock, through a system of tax and transfers that entails both static and dynamic efficiency losses and rea istically will result in some of the benefits going inadvertently to the nonpoo And, if so, should the transfer be in the form of current income or producti assets, such as investment in human capital? Numerical optimization of Bou guignon's model produces results that suggest that in the first few years adjustment the net social benefits of transfers to the poor will be less than tl social benefits to investment. Then, when recovery is under way, investment education and training of the poor will provide greater social benefits than w transfers of current income to them.

These illustrative results depend critically on the assumed values of a few ke variables, especially the increased productivity of capital during restructurir and the efficiency cost of taxes and transfers. Moreover the analysis, by inte tion, makes no allowance for the possibility that the economy is operating we

within its production frontier before the shock or for the possibility that the market signals necessary to guide investment decisions take time to be put in place. If these assumptions were dropped, the resulting optimal policy would include increased resources being made available for consumption by the poor in the short run. Finally, as Bourguignon shows, the availability of external assistance changes the preferred outcome significantly—transfers are part of the optimal strategy, even in the short run, with investment in human capital taking an increasing proportion of the transfers over time.

The level of abstraction in the Bourguignon model is both its strength and its weakness. In an effort to provide more realism, Bourguignon, de Melo, and Suwa analyze models representing a low-income African economy and a middle-income Latin American one. Their approach allows a richer representation of the underlying economic structure; relative to the Latin American model, the African one is characterized by greater wage and price flexibility, a lower stage of institutional development, and less integration with international financial markets. The authors expose the two models to the same external shock and then explore several alternative responses. These can be divided into two cases. The first is a no-adjustment case, in which the authorities rely on import rationing to support a constant real exchange rate. The second is a set of adjustment packages, including real devaluation, tax and tariff reform, and compensatory income transfers.

The value of these models lies in their ability to trace the consequences of alternative adjustment paths on income distribution. This simultaneously reveals the impact on the poor and the sources of likely political resistance to adjustment (such as those benefiting from prior policies). The analysis of options reveals two key points. First, the no-adjustment option increases poverty: during the seven-year simulation period the head count index of poverty increases from 30 to 40 percent in Africa and from 12 to 36 percent in Latin America. This result flows directly from the assumed reliance on import controls, a policy that creates rents that mainly benefit the rich. Second, initial conditions have an important effect on the outcome (including the distributional consequences) of adjustment policies. Thus the option including a real devaluation helps most of the poor (those living in rural areas) in the African case through higher export earnings but hurts those in the informal sector (see the conclusion of Sahn and Sarris). The same package, however, hurts the rural and urban poor in Latin America. Here the poor rely more on wage income, and, because market rigidities prevent the economy from responding to the new structure of incentives, employment and real wages fall.

Experience in countries as diverse as Costa Rica, Ghana, and Indonesia reinforces the conclusions drawn from these models. By far the most important point, and the main message of the Bourguignon model, is that the primary objective of adjustment should be to move the economy as quickly as possible to a growth path that allows effective implementation of the two-part strategy outlined in the *World Development Report 1990*. Three measures seem espe-

cially important: swift action to restore a sound fiscal position and to realign relative prices; some consumption-smoothing, either through a temporary cut in investment or increased capital inflows; and efforts to ensure that cuts in public expenditure are not at the expense of items, especially basic social services, that are crucial to the well-being of the poor. In some cases (such as Indonesia) this combination of measures may reduce poverty even in the transition. In other cases (such as Costa Rica) poverty will intensify in the short run. Nevertheless this package holds the best prospect for a least-cost return to a growth path consistent with sustained increases in the well-being of the poor.

Although it is important to keep this central point in mind, many countries, and rightly so, have experimented with compensatory programs designed to act as a safety net during the transition. In designing such schemes, attention must be paid to their success in reaching the intended beneficiaries, their fiscal cost, and their impact on incentives. Public employment schemes are often proposed as cost-effective ways to transfer resources to the poor, provided the offered wage is sufficient to meet basic needs but not high enough to attract the relatively rich. Newman, Jorgensen, and Pradhan explore these issues in the case of Bolivia's Emergency Social Fund (ESF).

The ESF was established as a temporary program during Bolivia's economic crisis to finance requests from local authorities for small, labor-intensive projects. Unlike most such schemes, projects were executed and the workers hired by private subcontractors. The program has been very successful in attracting and disbursing substantial external funds. However, Newman, Jorgensen, and Pradhan consider how the program has affected the earnings of the workers hired. Of particular interest is their attempt to define what the participants would have earned without the ESF. This effort to establish a counterfactual leads to important insights.

At first glance it appears that the ESF has not been particularly successful in reaching the poor because most of the participants fall in the middle rather than the lowest deciles of the earnings distribution. But the definition of earnings in this calculation includes the earnings from the program. Estimates of the earnings of these workers without the ESF indicate, however, that about 30 percent of the participants would have fallen in the two lowest deciles of the earnings distribution and more than 70 percent in the bottom four deciles. This conceptually more accurate assessment of the fund's success in reaching the poor emerges through specification of a counterfactual.

The key element that determines the distributional effect of the program is the wage. Because private subcontractors are used, who pay market rates, the wage fails to act as a screening device. Thus, although the average participant in the program earns 51 percent more, about two-thirds of the transfer is required to replace forgone income, and not all of the net transfer accrues to the lower income groups. Thus the scheme, although reaching many relatively poor people, is not an especially cost-effective way to transfer income to the poor. Other programs, such as the Employment Guarantee Scheme in Maharashtra State in

India, set wages low enough so that only the poorest choose to participate. In principle this increases the share of the transfer reaching the poor and reduces the fiscal cost of any given transfer to the intended beneficiaries.

The articles in this issue cannot conclusively answer how adjustment policies have affected the poor. But they do emphasize the correct way to approach the problem—through a careful comparison of the results of alternative policies. The articles by Bourguignon and by Bourguignon, de Melo, and Suwa demonstrate the required approach, but the lack of country-specific application may weaken their salience for the policymaker. Country-specific analysis, however, is limited by the number of countries with reliable household-level data for the 1980s. This suggests that for future work it may be necessary to increase the size of the sample by using an approach such as that of Sahn and Sarris. But to address the question of the effect of adjustment, their approach would need to be combined with an assessment of the impact of alternative adjustment policies on key relative prices. At the very least this approach would make best use of the available data while still emphasizing the importance of comparing alternatives.

But not all effects of adjustment work through prices. At least two other areas warrant additional work. First is the need to assess the distributional consequences of public expenditures, especially those on basic health and education. Although an analysis by income class may only rarely be feasible, examining the distribution of expenditures by region (most of the poor reside in rural areas) and by service (preventive versus curative care, for example) may be possible and can provide the basis for a more equitable (and efficient) allocation of spending within the constraint imposed by macroeconomic conditions. The second is the importance of examining the effectiveness of programs designed to compensate those most vulnerable to the adverse effects of adjustment. Many countries are now pursuing schemes similar to the ESF to cushion the impact of adjustment on the poor. The fundamental issue in assessing these schemes is their cost-effectiveness in achieving their objective relative to other options. Subjecting them to the kind of analysis undertaken by Newman, Jorgensen, and Pradhan could increase their effectiveness in transferring income to the poor.

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Poverty in Eastern Europe in the Years of Crisis, 1978 to 1987: Poland, Hungary, and Yugoslavia

Branko Milanovic

Eastern Europe experienced an economic crisis between 1978 and 1987. Declining income led to substantial increases in poverty rates in Poland and Yugoslavia, while poverty in Hungary remained at about the same level as before the crisis. In all three countries urban poverty increased, as the economic condition of state sector workers deteriorated to a much greater extent than that of agricultural and mixed households. The increased poverty was entirely explained by declining income, because the overall income distribution did not change or in some cases improved.

In the past decade countries in Eastern Europe have experienced declining growth rates, debt problems, worsening economic efficiency, and a widening technological gap compared with the West. These aspects of the economic crisis in Eastern Europe have been studied recently by, among others, Gomulka (1988), Gomulka and Rostowski (1988), Winiecki (1986), Zloch (1987), and Knirsch (1984). However, little is known about how the crisis has affected the standard of living and its impact on poverty. Most studies on these topics have been anecdotal or are concerned with income distribution rather than poverty (Flakierski 1986, Morrisson 1984, Okrasa 1988, and Bergson 1984).

This article charts the evolution of poverty in Poland, Hungary, and Yugoslavia during the 1980s. A headcount index of poverty is used to look at poverty rates by country, for various social groups, and in rural and urban areas. The slowdown of growth and the reversal in the resource transfer in the three East European countries were so great that they were reflected at the level of households in an almost uniform decline in real income and increase in poverty.

Section I looks at the effects of recession on poverty in socialist countries and how they differ from those in capitalist countries. Section II presents macro-

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economic indicators of the crisis in Poland, Hungary, and Yugoslavia and lc at the impact of the crisis on per capita income. Poverty lines, poverty rates, income distribution in the three countries are discussed in Section III. Sectioı analyzes the determinants of the poverty rate, and the change in the poverty is decomposed into the income, distribution, and demographic effects. Con sions are presented in Section V.

I. The Effects of Recession on Poverty in Socialist Countries

There are two primary ways in which the effects of recession on poverty n differ between socialist and capitalist countries. First, in capitalist economies total income of those with a relatively high share of capital income decrea faster than does the income of other groups. In socialist economies the share capital income in total household income is much less. Profits are originally ı received by individuals, but are retained by enterprises or transferred to ı state. Therefore a recession may not change the functional income distributi at the household level very much.

Second, the recession in the socialist economies during the 1980s was n accompanied by increased unemployment. In Poland and Hungary unemplo ment was virtually nonexistent, and in Yugoslavia unemployment as a percer age of the labor force remained unchanged. The wage bill was reduced throu uniform cuts in all wages. This probably resulted in part from the strong role ı workers' councils and trade unions at the enterprise level and in part fro government policies designed to prevent increases in unemployment (includir the subsidization of loss makers). Uniform wage cuts probably resulted in le severe effects on poverty than would have been the case if the same reduction i the wage bill had been achieved through layoffs (Nolan 1988–89; Buse 198 Sawhill 1985, p. 1092).

In capitalist economies unemployment benefits may sustain some of the unen ployed above the poverty line. However, the low share of capital income and th absence of increased unemployment suggest that the increase in poverty result ing from recession would, in a typical socialist economy and all other thing being equal, be less than in a capitalist economy.

II. Economic Crisis in Poland, Hungary, and Yugoslavia

The late 1970s marked the onset of economic crisis in Poland, Hungary, anc Yugoslavia. During the 1970s a substantial inflow of foreign capital had masked the effects of weakening economic performances. But the period of relatively easy and cheap borrowing drew to a close, and the 1979 oil shock and increased real interest rates in the early 1980s were final blows for East European econ- omies. By 1981 Poland, Hungary, and Yugoslavia were in deep crisis.

In Hungary and Yugoslavia the 1980s was a period of stagnation and crisis. In Poland two subperiods can be distinguished. From 1978 to 1982 real gross

domestic product (GDP) contracted by one-fifth, while from 1982 to 1987, GDP grew at an average annual rate of 5 percent. However, the current account deficit decreased from almost 6 percent of GDP during 1979 to 1982 to only 1.6 percent of GDP during 1982 to 1987. The impact of recovery on domestic demand and personal income was therefore less than the relatively high GDP growth rate alone would suggest.

Macroeconomic Indicators of the Crisis

Selected macroeconomic indicators of the crisis are given in table 1. Output per capita, which in the three countries grew at an average annual rate of between 5 and 7 percent during the 1970s, decreased in Poland and increased by less than 2 percent annually in Hungary and Yugoslavia during the 1980s. The substantial current account deficits that the countries were able to run in the previous decade were no longer feasible during the 1980s, when voluntary lending dried up. The squeeze on domestic demand originated from two directions: real output practically ceased to grow and resource transfers from abroad either decreased or became negative. All three countries attempted to protect personal consumption by making severe cuts in fixed investment. The decline in current consumption was arrested at some indeterminate cost in future output and consumption. The lower level of investment probably helped to widen the technological gap between these countries and the West (Brada 1989).

In Poland the crisis began in 1978, when the economy started on a fast downward plunge. GDP decreased by 20 percent during the next four years, thus recording the sharpest decline in postwar Europe. The level of GDP attained in 1978 was not regained until 10 years later. Per capita consumption was practically stagnant throughout the 1980s. After an almost 6 percent average annual growth in the 1970s, during the 1980s real wages declined by 3.7 percent a year. In 1987 real wages were thus 30 percent below the 1978 level. The share of gross fixed investment in GDP decreased by 8 percentage points.

Table 1. *Selected Macroeconomic Indicators of the Crisis*
(percent)

	Poland		*Hungary*		*Yugoslavia*	
Indicator	*1970–78*	*1979–87*	*1970–78*	*1979–87*	*1970–79*	*1980–87*
Per capita growth rate[a]						
GDP	+7.1	−0.6	+5.9	+1.9	+5.1	+0.9
Consumption	+6.5	−0.2	+3.7	+2.6	+4.5	+0.8
Real wages[b]	+5.6	−3.7	+2.9	+0.1	+2.1	−2.2
Share of GDP[c]						
Current account	−5.0	−3.5	−4.8	−2.5	−1.7	+0.2
Gross fixed investment	33.6	25.3	31.6	25.6	32.1	24.1

a. Average annual growth rate.
b. Real wages in the socialized sector of the economy.
c. Average annual value.
Source: Statistical Yearbooks of the three countries, except for current account, from IMF *International Financial Statistics* (various years), *Bilten Narodne Banke Jugoslavije* (various years), and IMF (1987).

and Yugoslavia. We then look at poverty rates by household type and in rural and urban areas in the three countries. Finally we briefly discuss income distribution in Poland and Yugoslavia.

Poverty Lines

Intercountry comparisons can be valid only if the poverty lines in each country are nearly equal. We would expect this to be true for Poland, Hungary, and Yugoslavia, which have similar levels of development,[1] population compositions (significant agricultural labor force), and social systems (the prevalence of state ownership outside agriculture, widespread redistribution and subsidies, and egalitarian wage structure in the socialized sector).

We have used the official subsistence minimum to calculate the incidence of poverty in each country (appendix A). The social minimums are official in that they were calculated by official institutions (generally attached to ministries) and have been used as poverty lines in broad social debates. In each of the three countries, however, the calculated subsistence minimum has not been used as an eligibility criterion for social aid.

The official poverty lines are given in table 3 in international dollars, in terms of purchasing power parity, and as a percentage of the average wage in the socialized sector. For each country the official poverty line given is the per capita social minimum based on an urban household of four persons in 1985. From table 3 it is evident that the official poverty lines in Poland, Hungary, and Yugoslavia are quite similar. In dollar terms the three poverty lines are almost identical. In terms of purchasing power the Hungarian subsistence minimum is the highest. This reflects the relatively low prices of consumer goods in Hungary.

Expressed as a percentage of the average wage, all three poverty lines seem high compared with those in Western Europe. Atkinson (1991) reports that the per capita poverty line for a married couple with two children ranges from 12.5 percent of the average production worker's wage in the former Federal Republic of Germany to 33.7 percent in Sweden. There seem to be two possible explanations for the relatively high (in terms of average wage) poverty lines in Eastern Europe. First, a less developed country would tend to have a higher poverty line in terms of average wage, because the poverty line would normally increase by proportionately less than the average income (or wage). Thus Kilpatrick (1973) uses survey data to obtain an elasticity of the poverty line with respect to income of about 0.6. Smith and Welch (1989, p. 524) assume an elasticity of 0.5. Hagenaars and van Praag (1982, pp. 151–52) obtain an elasticity of 0.54 for unchanged income distribution (elasticity is greater with a more unequal distribution). Based on surveys in the Yugoslav republic of Slovenia, Stanovnik (1989) estimates the income elasticity of the poverty line for urban households to be 0.57.

[1] According to 1989 World Bank data, per capita income in 1988 was $1,850 in Poland, $2,460 in Hungary, and $2,680 in Yugoslavia.

Table 3. *Comparison of Official Poverty Lines, 1985*

Country	*Dollars*[a]	*Purchasing power parity (international dollars)*[b]	*As a percentage of the average wage in the socialized sector*
Poland	52.5	85.4	38.6
Hungary	52.7	125.6	45.0
Yugoslavia	51.3	110.5	34.1

Note: Poverty lines were calculated on a per capita basis for an urban household of four persons.
a. Monthly amount, converted at the official exchange rate.
b. International dollar value of consumption purchasing power parity.
Source: Household surveys, except for international purchasing power parity values, from United Nations (1988, p. 24 and annex table 3).

In figure 1 the per capita poverty line is expressed as a percentage of the average wage and is plotted against an indicator of the level of development (real per capita consumption at international prices) for market and socialist economies. Among the socialist economies only Hungary stands out with a poverty line that seems too high for its level of income. Poland and Yugoslavia are almost exactly on the regression line. The elasticity of the poverty line with respect to income is 0.56.

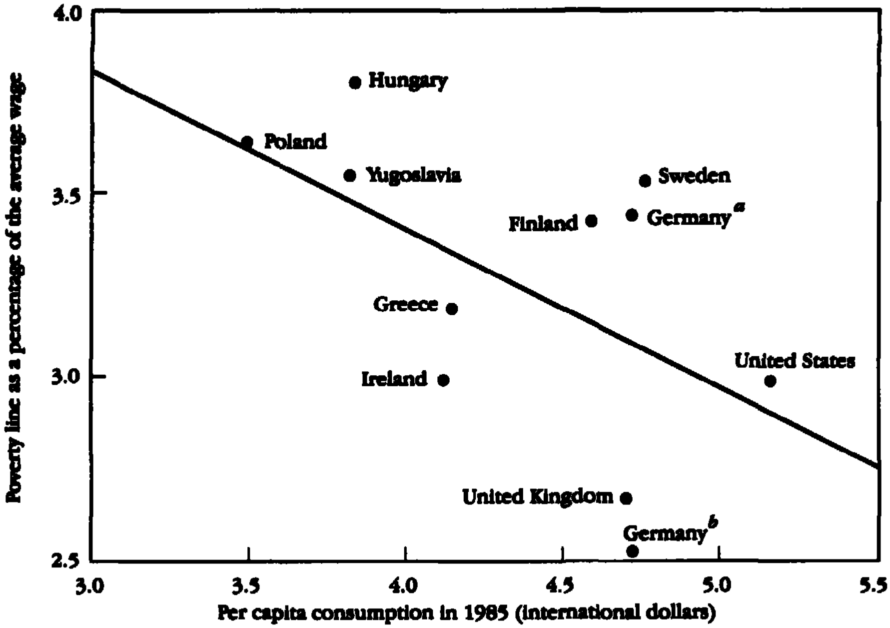
The second argument often used to explain the relatively high poverty lines in socialist economies is that poverty lines in socialist countries represent accounting devices that are devoid of any policy role. Households below the poverty line are not entitled to any benefits. Consequently, statistical poverty lines can be set at relatively generous levels. There may be some merit in this view, in that poverty lines that do carry policy implications (such as those of the former Federal Republic of Germany and the United Kingdom) are on the low side (see figure 1). The German example is particularly pertinent, since an estimated poverty line not related to policy is 2.5 times higher than the official line that triggers access to welfare benefits (see table 5). It is likely that, as Poland, Hungary, and Yugoslavia move closer to becoming market economies and develop welfare systems, official poverty lines will be lowered. It would be financially impossible to give income support to as much as one-fourth of the population.

Poverty Rates

During the 1980s the extent of poverty increased significantly in Poland and Yugoslavia and remained about the same in Hungary. Table 4 shows the estimated overall percentage of people living below the official poverty line in the three countries.[2] In Poland this percentage increased from less than 10 before

[2] A household whose income divided by the number of consumption units is less than the minimum (per consumption unit) is considered to be poor, and all members of the household are classified as poor. This approach was used for Poland and Yugoslavia. Hungarian data give subsistence minimums for different sizes and types of households, so that a direct comparison of household income with the minimum allows one to place the household above or below the poverty threshold. See appendixes A and B.

Figure 1. *The Poverty Line and the Level of Consumption*
(log scale)



Note: The poverty line is based on per capita income for an urban household of four persons. The estimated relation is log $(P/W) = f(C)$, where P/W is the poverty line as a percentage of the average wage in the country and C is real per capita consumption at international prices in 1985. The estimated regression is

$$\log (P/W) = \underset{(0.001)}{5.1645} - \underset{(0.082)}{0.4416} \log C$$

with $\bar{R}^2 = 0.221$ and $SE = 0.364$. Assuming that both W and C measure the level of income and writing ou the last relation, the elasticity of the poverty line with respect to income is equal to 1 - 0.4416 = 0.5584.

a. Based on a calculated poverty line, which is not related to policy. This poverty line is 2.5 times higher than the official poverty line.

b. Based on the official German poverty line, which triggers access to welfare benefits.

Source: Per capita consumption at international prices is from United Nations Statistical Commission and Economic Commission for Europe (1988), table 5.11, p. 29, except for the United States, from OECD (1987), table 8. The poverty line is from country governments (see Appendix A), except for market economies, from Atkinson (1990).

the crisis to about 22 in 1987. In Yugoslavia the poverty rate was about 17 percent in 1978; by the mid-1980s it stabilized at 25 percent. In Hungary the poverty rate remained between 14 and 16 percent throughout the period. For comparative purposes the incidence of poverty based on official poverty lines for several OECD countries is shown in table 5.

Poverty Rates by Household Type. The poverty rates of major social groups in Poland, Hungary, and Yugoslavia are presented in table 6. Following the Polish classification, the poverty rates are given for four social groups: farmers, mixed households, workers, and pensioners. Mixed households are those where

Table 4. *Estimated Poverty Rates for Total Population, 1978–87*
(percent)

Year	*Poland*	*Yugoslavia*	*Hungary*
1978	9.2	17.5	15.4
1979	9.7	n.a.	n.a.
1980	11.1	n.a.	13.8
1981	13.9	n.a.	n.a.
1982	19.8	n.a.	14.8
1983	23.7	12.8	16.7
1984	21.9	21.5	n.a.
1985	19.1	25.7	15.7
1986	17.3	25.1	n.a.
1987	22.7	24.8	13.8

n.a. Not available.
Note: Data are for population living below the poverty line as a percentage of the total population.
Source: Author's calculations based on data from country governments (see appendixes A and B).

at least one member works full time in agriculture, while another is employed in industry or services. Workers' households include both blue- and white-collar workers. If a household includes both a worker and a pensioner, it is included in one or the other group depending on the dominant source of income.

In Poland the poverty rate among farmers increased from 15 to 21 percent between 1978 and 1987. The peak was achieved in 1983, following a 10 percentage point decline in the terms of trade between agriculture and industry. The poverty rate for mixed households increased the least of all four household types. The poverty rate among workers increased fourfold during the period. At the outset of the crisis, workers had the lowest poverty rate among the four groups. In 1987 one out of four persons living in workers' households was poor. The increase in the poverty rate for workers was reflected in a 30 percent decline in their real wages and per capita real income. Thus in 1987 farmers and mixed households had average per capita incomes, respectively, 9 and 3 percent *higher* than workers (table 7).

Throughout the period in Poland, the poverty rate was greatest among pen-

Table 5. *Poverty Rates in Selected* OECD *Countries*

Country and year	*Percentage*
Greece, 1982	22.7
Ireland, 1987	21.2
United States, 1985	14.0
Sweden, 1985	8.6
Germany, Fed. Rep. of, 1983	6.1
United Kingdom, 1985	4.5
Finland, 1985	2.9
Japan, 1984	1.0

Note: Data for Germany are based on the calculated poverty line, which is higher than the official poverty line (Germany[a] in figure 1).
Source: Japan, Larin (1989); all other countries, Atkinson (1990).

sioners (see table 6). However, there were two distinct periods. In the first period the extent of poverty among pensioners increased rapidly. By 1983 one out of two persons in pensioners' households was poor. After 1983 the poverty rate for pensioners gradually declined to slightly over 25 percent in 1986 and 1987. This coincided with an increase in the number of pensioners from 11 percent of the total population in 1978 to almost 18 percent in 1987. The large number of new pensioners, whose pensions were higher than those of previous retirees, resulted in an increase in the average real pension and a drop in the poverty rate.

In Yugoslavia the poverty rate for the nonagricultural population (workers and pensioners) doubled; however, it remained lower than the poverty rate for mixed households and farmers. Unlike in Poland, the average per capita income for nonagricultural households remained higher than that of the other two groups (see table 7). The poverty rate for farmers declined sharply from 42 percent in 1978 to 27 percent in 1983 (when agricultural terms of trade improved), but increased to 45 percent in 1986 and 1987.

The real income of households in Hungary deteriorated much less than in

Table 6. *Poverty Rate, by Social Group, 1978–87*

	Percentage of population in each category with income below poverty line			
Country and year	*Farmers*	*Mixed*	*Workers*	*Pensioners*
Poland				
1978	15	10	6	21
1979	17	13	6	17
1980	17	11	8	24
1981	16	11	11	29
1982	21	16	17	36
1983	30	13	19	49
1984	25	13	19	39
1985	20	11	17	32
1986	19	9	17	25
1987	21	13	25	28
Yugoslavia				
1978	42	17	9	n.a.
1983	27	13	10	n.a.
1984	27	28	17	n.a.
1985	39	31	20	n.a.
1986	45	30	18	n.a.
1987	45	27	20	n.a.
Hungary				
1978	n.a.	n.a.	n.a.	21
1980	n.a.	n.a.	n.a.	17
1982	n.a.	n.a.	n.a.	13
1983	n.a.	n.a.	n.a.	18
1985	14	n.a.	18	14
1987	11	n.a.	17	11

n.a. Not available.

Note: For Hungary, farmers category includes mixed households. For Yugoslavia, workers category includes pensioners.

Source: Country governments (see appendixes A and B).

Table 7. *Per Capita Income, by Social Group, 1978, 1983, and 1987*
(percentage of per capita income of workers)

Country and type of household	*1978*	*1983*	*1987*
Poland			
Mixed	82	100	103
Farmers	91	107	109
Pensioners	77	78	93
Yugoslavia			
Mixed	70	87	91
Farmers	50	82	82
Hungary			
Pensioners	84	93	96

Note: Workers' income refers to the per capita income of workers' households in Poland, non-agricultural households in Yugoslavia, and active workers' and farmers' households in Hungary.
Source: Author's calculations based on data from country governments (see appendixes A and B).

Poland or Yugoslavia (see table 2). The poverty rate for workers was between 17 and 18 percent during 1985 to 1987. Poverty rates for pensioners and farmers decreased from 14 percent in 1985 to 11 percent in 1987.

Rural and Urban Poverty Rates. At the end of the 1970s poverty was predominantly a rural phenomenon in Poland, Hungary, and Yugoslavia. By the end of the 1980s it had become an urban phenomenon. However, the increased urban poverty did not occur as a result of rapid migration to the cities; it was caused by the gradual impoverishment of the already existing urban labor. The descent into poverty for the already established urban population was, among other things, associated with the inability to procure replacements for worn out consumer durables. Televisions, washing machines, and other consumer durables suddenly became too expensive for an ordinary household. Increased rents and electricity bills sharply compressed the affordable standard of living below the accustomed level. This reversed the standard of living to a level that households might have had some 20 years earlier.

Increased urban poverty can be politically accommodated if it is the result of people migrating from villages, looking for better jobs, and accepting a temporary decline in their standard of living. People in these circumstances assume that their situation will improve. A descent into poverty of the people who are already living in cities is socially more destabilizing. There are two reasons for this. First, there would be no basis for expecting that the situation would improve. This lack of hope has pervaded most of Eastern Europe in the 1980s. Such a feeling cannot exist in a rapidly industrializing developing society. Second, this was not a voluntarily accepted temporary decline in the standard of living, such as that existing among migrants.

The number and percentage of people living below the poverty line in rural and urban areas are presented in table 8. Before the crisis the rural poor accounted for 52 percent of total poor in Poland and three-quarters in Yugoslavia.

Table 8. *Population Below the Poverty Line in Rural and Urban Areas, by Country, 1978 and 1987*

	Rural	*Urban*	*Total*
		Thousands	
Poland			
1978	1,760	1,627	3,386
1987	2,441	5,879	8,321
Yugoslavia			
1978	2,592	837	3,429
1987	2,707	2,411	5,118
		Percentage of total number of poor	
Poland			
1978	52	48	100
1987	29	71	100
Yugoslavia			
1978	76	24	100
1987	53	47	100

Note: Rural poor are farmers and mixed households. Urban poor are workers and pensioners for Poland and nonagricultural households for Yugoslavia.

Source: Author's calculations based on data from country governments (see appendixes A and B).

About 10 years later the urban poor represented 70 percent of all the poor in Poland and almost one-half in Yugoslavia. The marked shift toward urban poverty is not to any significant extent the product of the changing structure of population. Between 1978 and 1987 the urban population increased by 15 percent in Poland and 24 percent in Yugoslavia; for the same period the number of urban poor increased 3.6 times in Poland and 2.9 times in Yugoslavia.

Income Distribution

The poverty rate for workers increased under circumstances of unchanged income distribution. The Gini coefficients for workers in Poland and non-agricultural households in Yugoslavia remained stable during the 1980s.[3] In 1981 and 1982, when real wages and real per capita income for workers in Poland plunged, the narrow dispersion of income was reflected in an extremely low Gini coefficient of 0.18. For the remainder of the 1980s the Gini coefficient was between 0.21 and 0.22 in Poland. In Yugoslavia the Gini coefficient varied between 0.30 and 0.32. Thus the increased poverty rate for workers in Poland and Yugoslavia occurred almost solely because of a uniform cut in real income. It appears that everyone was in effect pushed below the earlier wage (income) level by the same proportion, which left the shape of the income distribution curve unchanged. This is not an unexpected reaction in societies with a strong egalitarian tradition and in which enterprises are run by workers' councils or trade unions. It is beyond the scope of this article to try to ascertain whether such a uniform decline had some deleterious impact on productivity by, for

[3] This is the Gini coefficient of persons living in workers' households when households are ranked by their per capita income.

example, reducing absolute income differences and further discouraging (already scarce) innovation, risk-taking, and outstanding work effort. If this did occur, it might have unwittingly deepened the crisis (Socha 1989).

IV. Poverty, Income, and Redistribution

The study of poverty should enable us to relate changes in the incidence of poverty to macroeconomic variables and to disentangle the influence of income changes from the influence of income redistribution. If these relations can be established and found to be statistically robust, they would allow us to make conclusions about the impact of various macroeconomic measures on poverty. This section considers only Poland and Yugoslavia, since there are insufficient data for Hungary. In order to expand the time series and make our conclusions stronger, data for different social groups (workers, farmers, and pensioners) are pooled.

Determinants of Poverty Rates

Results of the estimated equation for the determinants of the poverty rates in Poland and Yugoslavia are presented in table 9. The first explanatory variable is average real per capita income of the social group, which we would expect to be negatively related to the poverty rate. The second explanatory variable is the Gini coefficient for each group, which we would expect to be positively related to the poverty rate.

The elasticity of the poverty rate with respect to income is 0.52 for Poland and 0.43 for Yugoslavia. Thus, in order to reduce the poverty rate by 1 percentage point, real per capita income needs to increase, on average and without any change in income distribution, by about 2 percent in Poland and 2.5 percent in Yugoslavia. The implication is that more people in Poland than in Yugoslavia are bunched slightly below the poverty line.

Table 9. *Determinants of Poverty Rates in Poland and Yugoslavia, 1978–87*

Country	*Constant term*	*Income term*	*Distribution term*	$\bar{R}^2$ *(F)*	*Standard error*
Poland	391.53**	−52.23**	9.105*	0.777	4.44
	(0.00)	(0.00)	(0.04)	(51.5)	
Yugoslavia	293.39*	−42.98**	46.405*	0.890	4.05
	(0.016)	(0.0)	(0.014)	(45.6)	

* Coefficient is significant at 5 percent level.

**Coefficient is significant at 1 percent level.

Note: For each country equation, data are pooled for different social groups. The equations are of the semilog form: POOR = constant + B1 log (income) + B2 log (distribution), where, for each social group and year, POOR is the percentage of the poor, income is the average per capita income, and distribution is the Gini coefficient. For Poland the social groups are workers, farmers, and pensioners. For Yugoslavia the social groups are agricultural and nonagricultural households. Data in parentheses show the level of significance at which the null hypothesis is rejected. The number of observations is 30 for Poland and 12 for Yugoslavia.

Source: Author's calculations.

Not unexpectedly, in light of the fairly egalitarian distribution of income in Poland, a given change in income inequality has less of an effect on poverty in Poland than in Yugoslavia. To reduce the poverty rate by 1 percent, inequality in the income distribution (measured by the Gini coefficient) must decrease by 2 percent in Yugoslavia and by more than 10 percent in Poland.

Decomposition of the Change in Poverty Rates

Even if the level and distribution of income remain the same, poverty rates could go up or down because of demographic changes in the population. Such demographic changes could be different population growth rates in rural and urban areas, migration of the population from one area to another, or changes in the distribution of the population among the major social groups. The change in poverty rates between 1978 and 1987 can be decomposed into three components: change in the overall level of income, change in the pattern of income distribution, and change in the demographic composition of the population.

In table 10 these three components are broken down into the income effect, the distribution effect, and the demographic effect. The data show that the income effect has been the most significant determinant of changes in the poverty rate in Poland and Yugoslavia. However, the implied increase in poverty resulting from the decline in income has been greater than the actual increase in poverty because redistribution in Poland and redistribution plus favorable demographic changes in Yugoslavia have combined to mitigate the impact of falling income. If the overall income in 1987 had been equal to that before the

Table 10. *Decomposition of Change in Poverty between 1978 and 1987*
(percentage points)

	Income effect	*Distribution effect*	*Demographic effect*	*Total effect*[a]
Poland				
Workers	+18.7	−2.4	+2.5	+18.8
Mixed	+9.8	−5.9	−0.2	+3.1
Farmers	+15.6	−7.7	−0.2	+6.5
Pensioners	+19.0	−11.3	+1.2	+6.8
Total	+16.7	−4.2	+1.5	+13.5
Yugoslavia				
Agricultural	+18.3	−15.4	0.0	+1.0
Mixed	+14.4	−3.1	−1.3	+9.4
Nonagricultural	+9.1	+0.2	+1.9	+11.4
Total	+11.8	−3.3	−0.7	+7.3

Note: The income effect is calculated by assuming the 1978 level of countrywide real income and everything else as it was in 1987. Average incomes of different social groups (or regions for Yugoslavia) are adjusted linearly, which implies that relative incomes of these groups are the same as in 1987 and thus may be different from what they were in 1978. The demographic effect is calculated by assuming the 1978 composition of the population (between social groups and sizes of households) and everything else as it was in 1987. The distribution effect is calculated as a residual.

a. The difference between the total effect and the sum of the three individual effects is due to an interaction term.

Source: Author's calculations based on country government data (see appendixes A and B).

crisis, then only 6 percent of the population in Poland and 13 percent in Yugoslavia would have been living below the poverty line in 1987. The actual poverty rates in Poland and Yugoslavia in 1987 were 23 and 25 percent, respectively. Poverty was raised by all three effects only in the case of nonagricultural households in Yugoslavia. The negative demographic effect was due to the higher population growth rate of the urban population in the less-developed regions.

V. Conclusions

The deep economic crisis that characterized Eastern Europe during the 1980s had a strong impact on average income and the percentage of people living below the poverty line. The situation deteriorated most sharply in Poland, where the number of people living below the poverty line increased from less than 10 percent of the population before the crisis to more than 20 percent by the late 1980s. In Yugoslavia the increase was somewhat less, from 17 to 25 percent. In Hungary the overall poverty rate remained constant. Perhaps as important was the change in the composition of poverty: whereas before the crisis most of the poor lived in rural areas, now most of the poor (as many as 70 percent in Poland) lived in cities. The urban, socialized sector (including white-collar workers) was the social group most affected by the economic decline. Their real wages, or the real per capita income of their households, declined by more than 30 percent in Poland and Yugoslavia. The reduction in income was accompanied by an unchanged pattern of income distribution; generally, socialized sector wages were cut uniformly across the board.

Appendix A. Poverty Lines and Social and Subsistence Minimums

For Hungary and Yugoslavia the social minimums are in effect subsistence minimums, which render it "possible merely to satisfy very modest necessities conventionally considered to be essential to ensure continuous living" (*Hungarian Statistical Yearbook* 1987, p. 328). Both Hungary and Yugoslavia also publish data on the social minimum, which is some 20 percent higher than the subsistence minimum. In the analysis for Poland, we use the social minimum, in which some 10 percent of resources are supposed to have been left at the discretion of the household to be used to satisfy nonessential needs. The Polish social minimum, however, is less, in real terms, than the subsistence minimum in Yugoslavia and Hungary (see table 3).

Consumption baskets are based on actual consumption patterns (for example, in Yugoslavia, the structure of consumption of the lowest income decile), which are corrected to reflect "healthy" normal consumption. All three minimums assume that the household rents a state-owned or cooperative apartment (with rents substantially below market levels). However, since most people either live in their own housing (necessitating only low direct maintenance expenditures and being charged mortgages at vastly negative interest rate) or in state or

cooperative apartments, the underestimate of the poverty line resulting from housing costs is probably small.

In Poland the social minimum has been calculated quarterly since 1980 by the Institute of Labor and Social Affairs. The basket of goods has been kept constant since 1983. In order to preserve an absolute standard of measurement, we have extended back to 1978 the real value of the social minimum for 1983.

In Hungary social and subsistence minimums have been calculated since 1982 by the Central Statistical Office. For the period before 1982, it was assumed that the ratio of the minimum to the average monthly per capita income was the same as in 1982. Since real per capita income in 1978 and 1980 was about the same as in 1982, this is tantamount to using a constant absolute level.

For Yugoslavia the social minimum has been calculated by the Federal Secretariat of Labor, Health, and Social Policy since the early 1980s. We had access only to 1987 and 1986 data; the values for other years were obtained by deflating 1987 data by the retail price index. In order to obtain the subsistence minimum, two categories (clothing and consumer durables) were excluded from seven categories of commodities that make up the social minimum.

The total percentage of people in poverty is obtained by applying different poverty lines to people belonging to different social (or regional) groups. In Poland there are four such minimums for workers', mixed, farmers', and pensioners' households. In Hungary there are separate minimums for each type of household (active and nonactive) and for each household size. In Yugoslavia there is a minimum for each of the eight republics or provinces. Consequently, the use of the national minimum in the combined set of data for all households will not in general yield the same result as the one presented here.

Appendix B. Sources of Data on Household Income

Polish results are based on annual household surveys conducted by the Central Statistical Office and covering 8,500 in the early years and more than 20,000 households later. Households are divided into four social groups (workers, mixed, farmers, and pensioners) and 7 to 8 income groups, ranked by per capita household income. The surveys are representative of about 90 percent of the population (the army, police, and private nonagricultural sector are not included).

Yugoslav data for 1978 and 1983 come from five-year surveys of 19,000 households. Data for other years are calculated from annual surveys of 6,000 households. All households are divided into three social groups (nonagricultural, mixed, and farmers) and between 10 and 11 income groups (ranked by per capita household income). Surveys are conducted by the Federal Statistical Office.

Hungarian data come from biannual household surveys conducted by the Central Statistical Office. For 1985 and 1987 it is possible to break overall data into three social groups (workers, farmers, and pensioners); for earlier years

only results for total population and pensioners' households could be calculated. The number of income groups varies between 8 and 12 (ranked by per capita household income).

There are no indications that the surveys have in general become less reliable or display a systematic bias throughout the period under study. The surveys, however, do have several flaws. For example, Polish samples have a response rate of only about 70 percent. The director of the Department of Household Budgets in the Polish Central Statistical Office points out that rejections are the highest among the poor and the well-off households (personal communication to the author). The incidence of poverty (even in relative terms) may therefore be somewhat understated. In Yugoslavia surveys include some inappropriate income items (such as revenues from the sale of assets). Since this item is shown together with income from the lease of assets, it is impossible to deduct it from income. Income is thus overestimated, and poverty incidence is biased downward. Income data in the surveys in all three countries fail to adequately reflect interest income from financial assets. When real return on these assets (including foreign exchange) was slightly negative or nil, the bias was not very significant. In the 1980s, however, the real rate of return on foreign exchange was almost continuously positive, and in some years it was very high. However, the real return on domestic deposits, particularly in Poland and Yugoslavia, which experienced high inflation, swung violently: in some years it was strongly negative, while in others it was around zero. Because of the lack of data on the distribution of financial assets by income groups, it is impossible to adjust income for this element. Consequent underreporting of income creates an upward bias in poverty statistics (even if the bias may not be high, since poor households typically have few financial assets).

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Macroeconomic Adjustment and Poverty in Selected Industrial Countries

Christopher A. Pissarides

The business cycle affects the incidence of poverty, as shown by evidence from Australia, Sweden, the United Kingdom, and the United States. Many of the poor in these countries are outside the labor market, and transfers are a major source of income for many others, but the unemployment and wage reductions that occur in recession increase the incidence of poverty. Major causes of poverty are unemployment in Australia and the United Kingdom and low wages in the United States. Similar cyclical effects are observed in Sweden, but a vast transfer program virtually eliminates poverty. There are several policy options for combating poverty caused by recession. A combination of unemployment insurance for a limited period followed by a job guarantee is the most effective policy toward unemployment, whereas poverty caused by low earnings can be remedied by redistribution through the tax system.

This article analyzes the relation between macroeconomic adjustment, in particular cyclical booms and recessions, and poverty in four industrial countries: Australia, Sweden, the United Kingdom, and the United States. The countries were selected for their diverse characteristics. The United States has the richest, most decentralized, and most diverse economy in the world, yet officially measured poverty is high and has remained largely unchanged since the late 1960s. The United Kingdom was the first country to introduce a comprehensive welfare state, but more recently it has been noted for its inflexible economy and high unemployment. Sweden is the most egalitarian Western society, with high taxation, a vast transfer program, and low unemployment. Australia combines features of the United Kingdom and Sweden: more corporatist than the United Kingdom but still suffering from many of its labor market problems.

Section I examines the characteristics and labor market status of the poor in each of the four countries. Although transfer payments are the main component of the income of the poor, the key to their changing fortunes during macro-

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economic adjustment is their labor market status. Individuals close to the poverty line move in and out of poverty during the business cycle in response to both changes in their employment status and fluctuations in their wage earnings.

Section II examines the differing incidence of unemployment, the income distribution, and the behavior of low wages during the business cycle. Recent theories of wage determination under different institutional arrangements suggest that, in the United States in particular, low wages are likely to be much more responsive to cyclical macroeconomic fluctuations than average wages are. Although this pattern is found to some extent in other countries, unemployment is likely to be a more serious cause of poverty during a recession in the United Kingdom and Australia than falling wage earnings.

Finally, section III considers the policy options available to combat the effects of the business cycle on poverty. Sweden's experience has shown that the combination of an unemployment insurance system with a job guarantee for the unemployed after some months of unemployment, or a training scheme for young unemployed persons, can be very effective in dealing with the poverty caused by unemployment. When poverty results from low wages, a negative income tax is the most natural way to provide income support. Institutional change can increase the flexibility of the labor market.

Although the emphasis here is on short-run changes in poverty resulting from temporary fluctuations in economic activity, labor market changes that are unrelated to the business cycle also affect the poor. Recent examples of such changes are the rise in European unemployment since 1974 and especially since 1979, which many think cannot be reversed by macroeconomic expansion, and the increased divergence between skilled and unskilled (and between white and black) earnings in the United States. I shall largely ignore specific references to such "structural" or "secular" changes in unemployment and wages, except to note two things. First, although in theory it is clear what is cyclical, secular, or structural, in practice these are less easy to identify. The recent fall in unemployment in the United Kingdom is a pertinent example: what many considered to be a secular rise in unemployment was largely reversed when the economy expanded after 1986. Second, changes in labor market incomes have the same effect on the poor, regardless of the source of the change. Thus, any discussion about the effects of cyclical fluctuations in labor market incomes applies equally well to changes in incomes caused by secular or structural factors. But the policy responses to structural or secular changes are likely to be different from the ones discussed here. Groups in the population that are chronically poor and are largely unaffected by business fluctuations may well see no benefit from the policies discussed.

I. The Poor and Their Sources of Income

In advanced countries where objective measures of poverty, such as malnutrition, are not relevant, poverty is a difficult notion to define. The approach

usually followed is to adopt a fairly simple definition that incorporates measured "equivalent" income, which is household income adjusted for household composition, and some broadly defined measure of household needs (for more discussion on the measurement of poverty see, for example, Sen 1976, Atkinson 1987, and Hagenaars 1986). Most countries adopt one of three conventions when measuring poverty. The first convention is to draw a "poverty line" such that all persons with equivalent income below this line are counted as poor. The poverty line is defined in real terms, so it is adjusted for inflation but not for changes in average income or in any other characteristics of the distribution of income. The United States was the first country to adopt such a definition of poverty. The real level of income that is used to define poverty in that country has not changed since its introduction in the 1960s.

The second commonly used definition of poverty is an administrative one and depends on existing social welfare policies. Many countries effectively guarantee a minimum level of income through income support programs, incorporating both cash and in-kind benefits. The income guaranteed is not in the form of a clear-cut "line" but depends partly on the subjective judgment of the social welfare officer in charge of each case. Nevertheless, the case officers follow guidelines established by a central welfare department, so it is possible to calculate the number of families receiving this kind of assistance and others with similar incomes not receiving it. These families are counted as the poor. This definition of poverty was in general use in the United Kingdom until 1985, when it was discontinued in favor of the third definition discussed below, and it is in use in public discussion in Sweden. The effective poverty line according to this definition varies with average income, because policymakers usually define the level of income support on the basis of average earnings. But adjustment of the guaranteed income level is not automatic and depends on the generosity of the government.

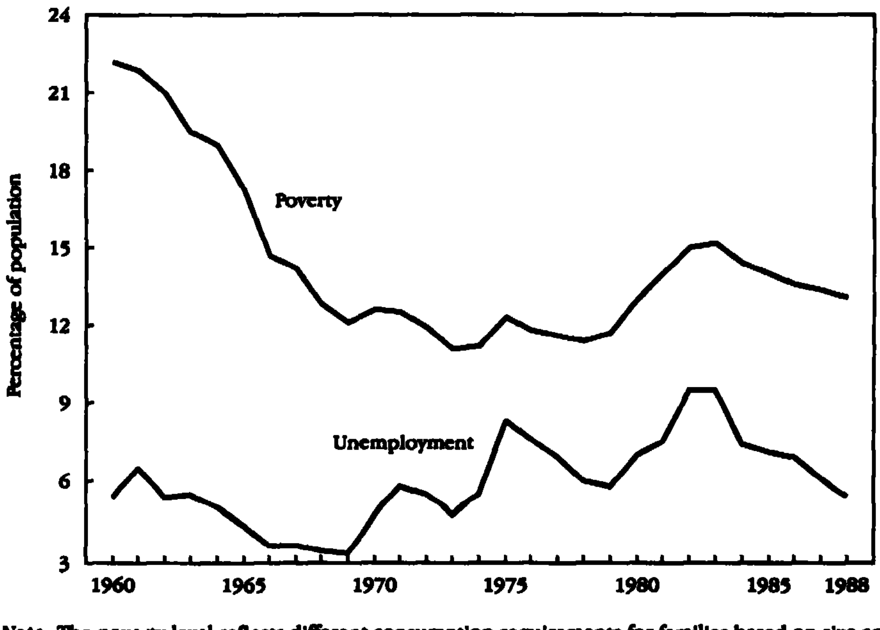
The third convention defines poverty in terms of the distribution of income; in the United Kingdom those with incomes not exceeding one-half of mean income are regarded as poor. When this definition is adopted, economic growth or business fluctuations do not influence officially measured poverty, unless they also influence the distribution of income. This definition of poverty is easier to compute than the others, and it is comparable across national frontiers and over time. For this reason it is often used in reports prepared for or by international organizations, such as the European Community (Commission of the European Communities 1981), the Organisation for Economic Co-operation and Development (OECD 1976), and the International Labour Office (Beckerman and others 1979).

Important as the difficulties in measuring poverty are, their significance for social research can easily be exaggerated. For many purposes, the precise definition of poverty is not very important. Indeed, for this study, an examination of the implications of booms and recessions for the incomes of households at the bottom end of the income distribution is sufficient. Exactly where the line that

divides the poor from the nonpoor is drawn is not very important in this analysis. What is more important are the sources of income of the poor and in particular how different types of income are affected by booms and recessions.

For the purposes of calculating poverty in the United States, household income is defined to include transfer income but not benefits in kind. (It is likely that in the future benefits in kind will also be included in official poverty statistics, but no comprehensive series is currently available.) The United States poverty rate was about 22 percent of the population in 1959 and 13 percent in 1988 (see figure 1). The poverty rate declined up to 1969, when fast economic growth and the introduction of a number of transfer programs reduced the poverty rate to 12 percent. Since 1970 the poverty rate has fluctuated around a flat trend line, with the fluctuations reflecting the temporary changes in incomes associated with the business cycle. This is shown in figure 1 by the close association between the poverty rate and the unemployment rate, which in the United States is a good cyclical indicator. The position of the poverty line in the income distribution has also been stable since about 1970, at about one-third the level of mean income (see the contributions in Danziger and Weinberg 1986, for example, Danziger, Haveman, and Plotnick 1986, p. 54).

Figure 1. *Poverty and Unemployment in the United States, 1960 - 88*



Note: The poverty level reflects different consumption requirements for families based on size and composition and on the age of the householder (before 1981 the sex of householder and farm-nonfarm residence were also considered). The unemployment rate refers to the total labor force.
Source: United States (1990), tables C-30 and C-39.

Table 1. *Composition of the Poor in the United States, 1967 and 1983*
(percentage of households)

	1967		1983	
Household head	*Pre-transfer*	*Post-transfer*	*Pre-transfer*	*Post-transfer*
Over age 65	50.6	40.4	42.8	21.3
Female with children under age 6	5.5	6.7	7.6	12.5
Student	4.0	5.5	4.2	6.9
Disabled	9.4	10.0	10.1	10.7
Full-time worker	14.7	19.1	9.1	14.4
All others	15.8	18.0	26.2	34.2

Note: The "all others" category includes single persons, male household heads, and female household heads with no children under age 6, who did not have a full-time job for the full year.
Source: Danziger, Haveman, and Plotnick (1986, table 1.3.4).

When discussing the composition of households below the poverty line, it is useful to distinguish between those who, because of personal circumstances, are not expected by society to work and those who are expected to work. The first group includes the elderly (over age 65), the disabled, and students; I also include women with children under school age, although whether this group should be included or not is more controversial. Women with children at or below pre-nursery-school age (about three years) are usually not expected to work if they do not want to, but the welfare services of the United States (supported by the Family Support Act of 1988) do expect women with older children to work. Norms are also beginning to change in the other countries because of the increasing availability of child care groups in society, which are often government-supported.

If transfers are ignored, the group not expected to work made up 65 percent of the poor in the United States in 1983, with the bulk (43 percent) composed of the elderly (see table 1). When transfers are taken into account, this group accounted for just 51 percent of the poor. If benefits in kind are also taken into account (for example, medicare, food stamps, and so forth), the group with labor market potential make up an even larger proportion of the poor. But even ignoring benefits in kind, as many as 62 percent of the poor under age 65 have no visible characteristic that should restrict their entry into the labor market. Since 1967, the relative importance of the group that is expected to work has increased. Table 1 shows that between 1967 and 1983 the proportion of the elderly decreased (largely because of an increase in transfers), whereas the proportion of workers without a full-time job throughout the year increased significantly.

The proportion of the income of the poor earned in the labor market and the proportion received as transfers are not available in official statistics. But using the panel study of income dynamics (PSID) of the University of Michigan, Blank (1989) estimates that labor earnings make up only 33 percent of the income of households in poverty, the rest being made up of transfers. Her figures include the elderly and the disabled, however, who earn less than 10 percent of their

income in the labor market. If this group is excluded, the percentage of income accounted for by earnings for the remainder of the households rises to about 55 percent.

More important, in contrast to labor income, the real value of the transfers received by the poor are largely unaffected by the business cycle, so that the financial circumstances of the poor change during booms and recessions because the labor component of their income changes. This is borne out by the analysis of Bane and Ellwood (1986), who find that for the poor less than 65 years old, about half of all poverty spells begin with a loss of earned income (38 percent because of the loss of the household head's income and 11 percent because of the loss of some other household member's income). Another 40 percent of poverty spells begin with a change of family circumstances, such as divorce or the birth of a child. Moreover, 73 percent of the poor move out of poverty when the household's earned income increases (50 percent because of an increase in the household head's income and 23 percent because of an increase in someone else's income) and only 15 percent of poverty spells end with an increase in transfer payments. Thus the study of the labor market status of individuals near or below the poverty line is critically important for understanding changes in poverty status during macroeconomic adjustment.

An analysis of the composition of households at the low end of the income distribution in the United Kingdom brings out even more strikingly the importance of the labor market for the poor during macroeconomic adjustment. The analysis of the composition of households with low incomes began in 1988 and is available only for three years, 1981, 1983, and 1985 (DHSS 1988). Because the statistics are not widely available, table 2 presents in full the composition of households with incomes below one-half the average income, by the economic status of the household head. The figures are very similar to those relating to the bottom percentile of the income distribution.

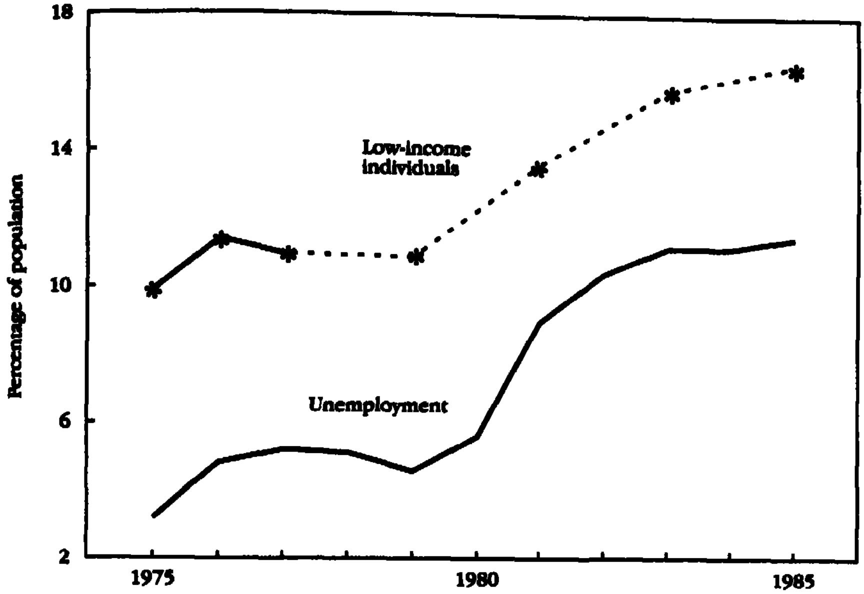
If the poor are defined as the members of households with less than half the average income, the most important factor associated with poverty is unemployment, with full-time work at low income coming second. The unemployed and

Table 2. *Composition of the Poor in the United Kingdom, 1981–85*
(percentage of households)

Household head	*1981*	*1983*	*1985*
Pensioner	13	10	12
Full-time worker	27	22	20
Sick or disabled	3	5	5
Single parent	8	6	6
Unemployed	44	43	48
Others	4	14	8
All poor as percentage of population	8.3	8.0	9.2

Note: Income is defined as total disposable income of the household, including transfers, and adjusted for household needs.
Source: DHSS (1988).

Figure 2. ***Low-Income Individuals and Unemployment in the United Kingdom, 1975 - 85***



Source: For 1975-77, Atkinson (1983), table 10.2. For 1979-85, CSO, *Social Security Statistics*, table 47.07; CSO, *Annual Abstract of Statistics* (1988), table 2.1; and OECD, *Historical Statistics*, table 2.15.

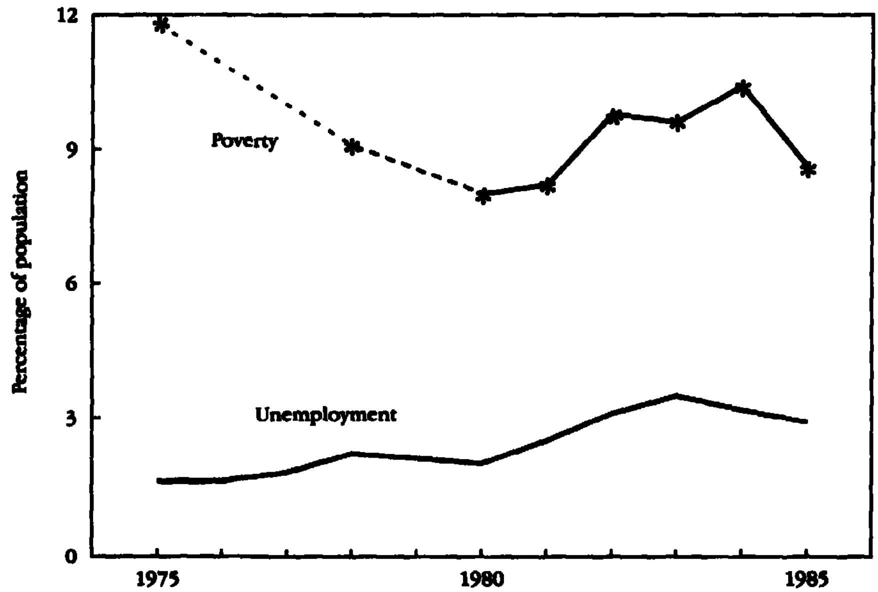
full-time workers combined make up almost 70 percent of the poor in 1985. Thus changes in unemployment and low wages during macroeconomic adjustment are likely to have a big effect on poverty. The increase in poverty between 1983 and 1985 is explained largely by the increase in unemployment between these two years. Figure 2 demonstrates with a different set of data the importance of unemployment in British poverty. This figure uses the administrative definition of poverty commonly used until recently, which counts as poor all those receiving the supplementary benefit and those with similar incomes who do not receive it. Unemployment and poverty in the United Kingdom from 1975 to 1985 clearly moved together.

The income of the bottom percentile of the income distribution in the three years covered by table 2 consisted mainly of transfer payments. Transfers accounted for 71 percent of all income in 1981, 73 percent in 1983, and 75 percent in 1985 (DHSS 1988; no other breakdowns of income sources are possible with the available data). This, however, does not negate the importance of the labor market in determining the extent of poverty. All groups listed in the table, except for full-time workers, are automatically entitled to some form of income support because they have insufficient labor-market income. Sometimes full-time workers are also entitled to support if their income is too low. If the

labor-market income of a household increases, transfers drop, but the household still has a better chance of moving out of poverty.

Sweden has the most generous social welfare system in the Western world. Expenditure on social services by the government amounts to about 30 percent of gross national product (GNP), whereas in the United Kingdom it is less than 20 percent and in the United States less than 15 percent of their respective GNPs (Luxembourg Income Study 1979–80, reported in Gustafsson and Uusitalo 1989). A definition of poverty based on the level of income assistance is therefore likely to show high poverty rates in Sweden. Indeed, this is borne out in recent estimates of the administrative poverty rate in Sweden by Gustafsson (forthcoming) and Gustafsson and Uusitalo (1989) (see figure 3). The estimates are based on the guidelines for social assistance for a single year (1985) so the implied poverty line is fixed in real terms. The fall in poverty since 1975 has largely been the result of transfers. Pre-transfer poverty (for families) increased between 1975 and 1985, from 35 to 42 percent, whereas post-transfer poverty fell from 15 to 11 percent. Figure 3 also shows movements in Swedish unemployment. Although there is some connection between short-run fluctuations in

Figure 3. *The Administrative Poverty Rate and Unemployment in Sweden, 1975-85*



Note: Persons below the absolute poverty line estimated by Gustafsson-Uusitalo (1989). The unemployment rate refers to the total labor force.

Source: Poverty data from Gustafsson-Uusitalo (1989); unemployment rate data from OECD, *Historical Statistics*, table 2.15.

Table 3. *Percentage of Families in Lowest Sextile of Income Distribution in Sweden, the United Kingdom, and the United States*

Family type	*Sweden*	*United Kingdom*	*United States*
Single men	15.3	5.9	21.4
Single women			
with no children	21.4	20.0	19.5
with children	30.8	68.6	57.7
Married couples			
with no children	9.8	6.7	5.4
with children	18.4	17.7	16.1

Note: The classification is according to equivalent disposable family income.
Source: Rainwater, Rein, and Schwartz (1986, table 1.3.6).

the poverty rate and fluctuations in unemployment, the link between them is not as close as in the United States and the United Kingdom. Unemployment does not appear to be as important a cause of poverty in Sweden as in the other countries, almost certainly because of the many measures of support available to unemployed workers in Sweden.

Another way to look at the Swedish data, which puts into better perspective the small extent of poverty in that country, is to make use of the comparative study by Rainwater, Rein, and Schwartz (1986). Although the study uses data for 1970, or a year near it, it is unique in its coverage of comparable income distribution data in Sweden, the United Kingdom, and the United States. The study defined poverty as the head count of those 25 to 55 years old with income below half of median income. Using this definition, poverty in Sweden amounted to 2.1 percent, in the United Kingdom 3.4 percent, and in the United States 10.9 percent. Interestingly, the poor in Sweden had closer (or the potential for closer) ties with the labor market than the poor in the other two countries. Table 3 gives the proportion of five family types that are found in the lowest sextile of the income distribution, on the basis of equivalent disposable income. Although in all three countries the group with the biggest concentration at the bottom end of the income distribution is single women with children, in Sweden the percentage is much lower than in the other two countries. Altogether, low-income rates in Sweden are more uniform across different groups of the population. Thus, when compared with the other two countries, Sweden has more of its poor in groups that have closer attachment to the labor force, such as single men and married couples with or without children. The role of Sweden's welfare state in lifting the groups with less labor force attachment out of poverty is the key to this comparison. Moreover, because Swedish unemployment is much lower than in either the United States or the United Kingdom, more poor families in Sweden have an employed head. In all three countries, but even more so in Sweden, most married couples with working wives escape poverty.

Poverty in Australia was first studied systematically by a Commission of Inquiry, which reported in 1975 (Australian Commission of Inquiry in Poverty 1975; the recommendations of the commission were not officially accepted but

became a standard reference on poverty in Australia). It recommended the adoption of what became known as the Henderson poverty line, first applied by R. F. Henderson in a study of the poor in Melbourne in 1966. The Henderson line was first defined along the lines of the U.S. poverty line, but after 1980 it was fixed in terms of the distribution of income, at about half of the mean income for the standard family.

The commission made a detailed study of the poor in Australia on the basis of a survey conducted in 1972–73. Beckerman and others (1979) did a similar study for the International Labour Office using a 1973–74 survey, and the Australian Social Welfare Policy Secretariat (1981) further calculated the extent of poverty, comparable with Beckerman's, for 1978–79 (despite the existence of an updated poverty line, it has not been possible to find a time series of poverty rates for Australia comparable with the ones that appear in figures 1–3 for the other countries). These studies concluded that poverty in Australia followed a pattern similar to that in the United States and the United Kingdom. The role of unemployment as a cause of poverty was once again brought out, although, as in the other countries, the main feature of poverty in Australia is the overrepresentation among the poor of single mothers and those over 65 years old. Table 4 gives some of the results of the comparison between the 1973–74 and 1978–79 surveys, in a form comparable with that used in table 3 for the other countries.

The groups that had the highest incidence of poverty in Australia in 1973–74 were the elderly and single parents. The poverty rate of the elderly, however, declined dramatically between the two surveys because an increase in pensions lifted them just above the poverty line. The poverty rate of single parents remained constant, whereas that of married couples and single people without children increased. The reason behind the increase in poverty is the higher unemployment in 1978–79. Unemployment in 1973–74 was 2.5 percent, and in 1978–79 it increased to 6.5 percent. In addition, the final column of table 4 shows that most of the poor belong to demographic groups that have close links

Table 4. *Composition of the Poor in Australia, 1973–74 and 1978–79*

Family type	*Percentage of family type counted as poor* 1973–74	1978–79	*Percentage of all poor, 1978–79*
Over age 65	26.1	8.9	17.7
Single persons			
with no children	8.9	11.2	33.7
with children	36.8	36.3	16.5
Married couples			
with no children	3.4	4.0	8.1
with children	6.8	7.4	24.1
Total	11.1	9.3	100.1

Note: The computations are on the basis of equivalent disposable income.
Source: Calculated from the information in Australian Social Welfare Policy Secretariat (1981, table 5.6).

with the labor market. The group labeled single persons with no children are mostly youths who are either unemployed or employed in low-income jobs. The other principal group, married couples with children, consists mainly of one-income families with one to three children, although there are also some unemployed heads. Families with two incomes are rarely, if ever, found below the poverty line, confirming the importance of working wives for a family's financial well-being.

Thus, although in the four countries under study the elderly and single parents have on average lower incomes than the rest of the population, most of the poor are persons with close links to the labor market. Part of the reason is that welfare policies are targeted mainly at groups that are not expected to have those links. But another reason is simple demography: in advanced countries healthy people under age 65 who are not single parents of preschool-age children are in the vast majority of the population. Among these, some are employed in low-wage jobs, some are unemployed, and some have irregular work patterns. These groups make up the majority of those who move in and out of poverty during recessions and booms. Even if a large part of their income consists of transfers, it *is fluctuations in their labor income that determine whether they become poorer* or richer during the cycle. Given this fact, the response of real wages and unemployment to macroeconomic change is a central issue in the study of poverty during macroeconomic adjustment.

II. Cyclical Fluctuations in Low Incomes

It is natural for the economist interested in employment and wage determination during the business cycle to turn to supply and demand analysis. Can equality between the supply and demand for labor services explain employment and wage determination during the cycle? The answer most frequently given is that it cannot. Two related empirical features of cycles are inconsistent with the "competitive" equilibrium framework. First, employment fluctuates by more than this framework would lead us to expect, and, second, wages fluctuate by less. Thus during recession there is high unemployment and little change in average wages. The cost of recession is borne mainly by those who lose their jobs, whereas those retaining employment apparently suffer little in comparison.

These observations relate to total employment and average wages, and they have stimulated many interesting new ideas in modern macroeconomics. Their relevance to poverty during macroeconomic adjustment is twofold. First, the preceding section argued that there is a close link between unemployment and poverty. So, if cyclical fluctuations cause fluctuations in unemployment rates, they should also be expected to cause similar fluctuations in poverty rates. Second, the modern theory of wage determination provides insights into the factors that are likely to influence wages during macroeconomic adjustment. It is argued by proponents of this body of theory that such factors are not likely to

cause large fluctuations in average wages. By applying the same principles to the determination of low wages, we may well be able to make some inferences about the behavior of low wages during the business cycle.

Three implications of recent theories of employment and wage determination are of particular relevance to the poor. First, in most industrial countries low-income workers are likely to be unskilled and employed mainly in manufacturing and other production industries, which are the sectors of the economy most exposed to cyclical shocks. (The United States provides an exception that will be discussed below.) It follows that if cyclical shocks lead to fluctuations in unemployment, low-income workers will be more at risk than the average worker. Moreover, because they are the unskilled workers in their sectors, low-income workers are also likely to bear most of the unemployment in their sector. Workers in unskilled occupations frequently fall into poverty because of unemployment; when the economy picks up and they move back to employment, they cannot move far from the poverty line because of low wages.

This description is certainly true of the poor in the United Kingdom and Australia, and to a lesser extent in Sweden, which does not suffer much unemployment in recession (on the United Kingdom see Pissarides and Wadsworth 1990). In the United States, manufacturing wages are higher than in unskilled jobs in the service sector, where many of its poor work. Although the service sectors are also exposed to cyclical risks, they are not as exposed to the risk of unemployment as the manufacturing sectors are. Thus moving in and out of unemployment may well not turn out to be as serious a problem for the poor in the United States as it is likely to be in the United Kingdom and elsewhere.

The second implication about low wages that can be drawn from recent theories of wage determination relates to the responsiveness of wages to cyclical change. Recent theory argues that although wages are not very flexible during the cycle, they do respond to a rise in unemployment because of the threat that unemployment imposes on those still employed. Because low-income workers are more exposed to the risk of unemployment, their wages are also likely to be more responsive to cyclical shocks than the wages of the average worker. The average worker is hardly exposed to the threat of unemployment in most countries because of long job tenures and, in some countries, job security legislation and union influence. Average wages respond to unemployment over the cycle almost certainly because low wages respond to it.

The third argument of relevance here is that many of the unskilled, low-paid workers who make up the bulk of the poor are likely to be found in secondary sectors of the labor market that lack the organized institutions of the primary sectors. This is certainly true of low-income women without regular work patterns, but it may also be true of some men, especially youths and minorities. The low-skill service jobs that employ many of the poor in the United States are typical examples of the jobs found in the secondary sector of the labor market. Enterprises in secondary sectors operate in a market environment that is closer to the competitive paradigm than is the market environment of the primary

sectors, so that the business cycle is likely to lead to more wage fluctuations in the secondary sectors than it does on average in the primary sectors. Because incomes in the secondary sectors are typically lower than in the primary sectors, this is another reason for expecting the business cycle to lead to more wage fluctuations at the lower end of the wage distribution than on average.

A related factor is that much of the production in the secondary sectors takes place at the margins of profitability. Many companies in these sectors are not well-established, profitable concerns, and even small recessions may lead to bankruptcies and closures. In events such as these, the workers in these sectors are once again likely to lose income because of unemployment.

Thus comparing the fortunes of the poor with the fortunes of the average worker during recession may well show that the poor experience more unemployment *and* more wage reductions. Both unemployment and wage reductions contribute to poverty. In the final analysis, what cushions poverty in recession is not any particular response of market variables to the recession, but the response of transfer payments that are designed to provide income support for the unemployed and those with low incomes.

Evidence on the behavior of low wages and the unemployment of those who receive them during the business cycle is scant. Blank (1989) examined the behavior of the income of various groups of the population during 1969–81 using the Michigan PSID. Although she did not distinguish between the changes in annual hours of work resulting from unemployment and the changes resulting from overtime, short time, and other variations in the length of the work week, her results shed interesting light on the behavior of the income of poor households in the United States. As might be expected from the preceding discussion, heads of poor households experience more cyclical variations than other workers in both annual hours of work and in hourly earnings. Hours of work and hourly earnings are both strongly procyclical, so total labor income increases during a boom for both reasons. A 1 percent increase in GNP is associated with a 2.57 percent increase in the average hourly earnings of the heads of poor households and with a 1.25 percent increase in their annual hours of work. Total labor income increases 3.05 percent. The other components of household income (spouse's labor income, transfer income, and other income) do not show much cyclicality, so, despite the small fraction of total income accounted for by the head's labor earnings, the total income of poor households shows procyclicality. On average, the total income of poor households increases by 1.61 percent when GNP increases by 1 percent.

The responsiveness of hours of work and hourly earnings to the cyclical changes in GNP declines at higher incomes, so persons higher up in the income distribution experience less cyclicality in their earnings than persons below them. For example, the total income of the third quartile increases only by 0.82 percent when GNP increases by 1 percent, with total hours increasing by 0.52 percent and hourly earnings by 0.64 percent. This is very much in line with the argument that higher incomes are found in the primary sectors of the economy,

in which workers are less exposed to the risk of unemployment and wages are more protected from cyclical shocks than are wages in other sectors. Thus the income distribution shrinks in booms and expands in recessions. In a recession, poverty increases not only because incomes are generally lower, but also because the expansion of the income distribution shifts more households into poverty at given mean income.

The labor income of wives in poor households does not show strong cyclicality on average. This apparently paradoxical conclusion is explained by offsetting changes in the hourly earnings and hours of work of wives. The hourly earnings of wives show even more procyclicality than the average earnings of heads of households, perhaps because wives are even more likely to be in the secondary labor market than their husbands are. But wives in poor households also exhibit strong anticyclical behavior in their participation decision (what is often called the "added worker" effect). Although continuously employed women reduce slightly their hours of work during a recession, women previously outside the labor force seek employment to cushion the loss of household income resulting from the loss of the head of household's income. Usually the jobs that these women get pay well below the average paid by jobs held by similar continuously employed women. When the economy recovers and their husbands regain their lost incomes, these women leave the labor market. Thus the added worker effect provides an important cushion against the loss of income of poor households in recession, although the labor market performance of women as a whole offsets only the loss suffered by the drop in the earnings of those women already in the labor force.

Detailed information on the behavior of low earnings (and more generally on the income of the poor) during recession in Australia, Sweden, and the United Kingdom is not available. Comparing the structure of the labor market in the United States and in the other countries may allow some inferences about the behavior of low earnings in the other countries. The main question is whether the market at the low end of the wage distribution in the other countries is organized like it is in the United States. The answer is that it is not likely to be. There are important organizational differences at the mean, and this alone should warn that there may be organizational differences at the low end. More direct evidence relates to union coverage in the four countries and to the influence of central institutions in wage bargaining.

The United States has the least union coverage, and central institutions have no influence on wage negotiations. The market at the low end of the wage distribution is not well organized, and, as argued in this section, the behavior of wages and employment at this end is far closer to the competitive paradigm than the behavior of the same variables at the mean. In Sweden the wages of blue collar workers in manufacturing are negotiated at the central level, so union influence and centralization are as prevalent as for the average worker. Complete centralization, however, may produce as much flexibility as complete decentralization (Calmfors and Driffill 1988). The reasons behind the flexibility

are different but the outcome need not be. In a completely decentralized economy, wage flexibility results from the forces of competition operating at the level of the firm. In a centralized economy, wage flexibility is the outcome of the realization by the central negotiators that their own wage choices influence aggregate employment. If they want to have more employment, they cannot rely on someone else to bring it about (be it the central government or other unions moderating their wage demands). It can be brought about only by moderating their own wage demands. Thus the economic forces in Sweden may well produce as much wage flexibility at the low end of the wage distribution as in the United States.

One must also consider Sweden's policy of egalitarianism. Aggregate employment and wages are not the only objectives of central wage negotiators; the narrowing of differences in income is another. Although egalitarianism is achieved mainly through large transfers, it has also affected wages and employment policy. Big discrepancies in the wages negotiated for different job classes are avoided, and the workers displaced during recession have the choice of a job created by the government for the unemployed. About half of the workers who lose their jobs in Sweden gain employment through this scheme. These government job offers are in addition to the large transfers to low-income workers, which all but offset the effects of the fluctuations in market wages and unemployment on poverty.

In the United Kingdom wage negotiations take place in a different institutional environment. Unions or the wage councils affect the wages negotiated in virtually all of manufacturing and in about three-quarters of the rest of the labor force. Negotiations take place at the enterprise level, with central policy or central institutions having little influence. This has been especially true since 1979, when free market discipline has been used as the main weapon against union wage demands. The United Kingdom's institutional wage structure is the least flexible of the countries under consideration. When wages are negotiated by unions that are strong in their own enterprise but weak in influencing wages elsewhere, the link between a single union's wage demand and national unemployment is broken. Each union attempts to protect the wages of its members and feels unable to do much about the unemployed: even if it moderated its own demands to encourage more job creation, the number of jobs created would be insignificant compared with aggregate unemployment. If all unions behave in the same way, wages become highly unresponsive to macroeconomic shocks, and unemployment bears the burden of adjustment. This is as true on average as at the bottom end of the wage distribution, except that at the bottom end unemployment is more of a threat. A prolonged recession may eventually lead to wage reductions. This seems to have occurred in the United Kingdom during the severe recession of 1979–81. After two decades of remarkable stability in the earnings distribution, the ratio of wages in the lowest decile to median wages fell from 66 percent in 1979 to 61.6 percent in 1981 (Atkinson 1989, chap. 6). But overall, the structure of the labor market in the United Kingdom is such that

wages, even at the lower end of the wage distribution, are expected to be much less flexible than they are in the United States. The main factor influencing low-income households during recession in the United Kingdom is unemployment.

The Australian labor market is somewhere between the British and Swedish examples, with features of both in the behavior of wages and unemployment. Although wages are negotiated largely within each enterprise, as in the United Kingdom, direct government interference with the wage negotiation process and central institutions (in particular the Arbitration Commission) have had some influence on wage negotiations. Australia's institutional arrangements are a mechanism that influences wage negotiations by improving the general understanding between national union organizations and national employer organizations. Their direct effect on particular episodes of wage negotiations appears to have been exaggerated by some Australian economists: the Australian labor market certainly resembles the British market more than the Swedish market (Pissarides 1991, Calmfors and Driffill 1988). Thus the main implications of recession for the poor can be discerned by looking at the behavior of unemployment and overall wages in manufacturing. Manufacturing wages declined slightly after 1975 (elsewhere in the economy there has been moderate growth), and this has probably had some effect on poverty. But as in the United Kingdom, the main effect of recession on the poor in Australia is through unemployment.

Other evidence of relevance to the poor may be obtained by looking at changes in the distribution of total disposable income during the cycle, without attempting the difficult task of decomposing these changes into individual components. The poor are inevitably concentrated at the lower end of the income distribution, and their welfare depends, in the final analysis, on their total disposable income. Thus, looking at changes at the low end of the income distribution offers an all-encompassing approach to the investigation of the effects of the cycle on poverty.

Looking again at the evidence for the United States, it appears that the conclusion reached by Blank (1989) with data from the PSID is confirmed with aggregate data. Blinder and Esaki (1978) and Blank and Blinder (1986) examined the response of the income distribution during the cycle. They used both unemployment and inflation as cyclical indicators and regressed the income share of each quintile in the working population on the two cyclical indicators, on time trends, and on lagged dependent variables. They concluded that although inflation has no discernible effect on the distribution of income, unemployment has a strong expanding effect: when unemployment increases, incomes at the lower end of the distribution fall by more (in relative terms) than incomes at the higher end of the distribution, so income shares shift rightward. This confirms earlier results about the effect of unemployment on income shares (see, for example, Metcalf 1969).

Similar work with aggregate time series data was carried out by Nolan (1987) with data from the United Kingdom. The results with the U.K. data were similar to those with the U.S. data, but they were less well determined. Results for the

lowest quintile were statistically better than for higher quintiles and showed that a 1 percentage point increase in unemployment reduced the income share of the lowest quintile by 0.21 percentage points. This compares with Blinder and Esaki's (1978) estimate for the United States of a 0.13 percent reduction and Blank and Blinder's more recent (1986) estimate of a 0.185 percent reduction.

Thus unemployment is found to influence the distribution of income. The magnitude of the effect of unemployment on the overall income of those who suffer it will also depend on the duration of unemployment. Here again there are some differences among the four countries. In the United Kingdom and Australia, increases in unemployment tend to be accompanied by increases in duration. Thus in these two countries the direct effect of unemployment on the distribution of income, through the income of those that experience it, is likely to be larger than it is in Sweden and the United States. In Sweden unemployment is low and of short duration because of the job guarantee available to unemployed persons, whereas in the United States the average duration of unemployment is shorter at a given rate of unemployment than it is in the United Kingdom and Australia. Allowance should also be made for the available state support to the unemployed. In this regard, the United States offers the least support, followed by the United Kingdom and Australia and then Sweden, where unemployed workers have as much as 88 percent of the disposable income of full-time workers (Vogel and others 1988, p. 145). Although no similar statistic is available for the other countries, their unemployment compensation averages about 50 percent of lost wage earnings. Coverage in the United States is only 25–30 percent of the unemployed, whereas in the United Kingdom and Australia coverage is virtually universal. The direct effect of unemployment on the distribution of income also depends on whether we consider the distribution of annual income or the distribution of income in a shorter time period, such as a reference week. For annual incomes, the effect of unemployment is reduced (see Nolan 1987, chap. 5–6).

III. Policy Options

Economic policy affects poverty at three levels. First, policies that are not specifically designed for the poor, such as macroeconomic management, have an influence on poverty through their effect on variables that enter the poverty equation, such as unemployment and wages. Second, transfer payments, most frequently designed to provide income support for low-income groups, influence the well-being of those who receive them and those who pay the taxes that finance them. Third, some of the policies designed to provide income support, especially transfer payments, influence the behavior of recipients. Such "disincentives" may offset to some extent the original policy goals.

The debate over the effects of policy on poverty has centered mainly on the question of the disincentives of transfers. An optimal government policy to fight poverty through redistribution should redistribute a given income to the poor

with minimum efficiency loss. The efficiency loss in transfers to the poor results from reduced labor supply by the recipients and possible changes in family structure induced by the policy. The corresponding financial cost consists of the loss of output because of the reduced labor supply, and the extra cost of the transfers to those who need to be supported for longer because of the choices they make. From society's point of view, the limits to redistribution are the efficiency losses of the policy.

Of course, policies designed for some specific purposes have implications for policy goals outside their immediate environments. This is as true for macroeconomic policy as for other policies. Macroeconomic policy is usually directed at things like price stability, full employment, exchange rate stability, credibility in foreign debt obligations, and so on. The policies designed to achieve these objectives have implications for poverty, but normally their influence on poverty is incidental, and it does not receive high priority in the design of macroeconomic policy.

If the reduction of poverty were a goal of macroeconomic policy, it is clear what the recommendation would be: lower unemployment. But this recommendation may conflict with other objectives, such as price and exchange rate stability, that do not directly influence poverty. A better policy advice would be to identify the poor as a group and target redistributive policy toward them in a way that offsets any harmful effects of macroeconomic policy on poverty. The reduction of poverty as a policy objective should come into the macroeconomic policy debate only if redistribution cannot undo what macroeconomic policy does to poverty. This is where the disincentives of transfers become the key to policy design. Without disincentives, transfers can obviously achieve any poverty rate that is desired, regardless of macroeconomic policy. But if the disincentives of transfers are serious enough, this will not be possible. In this case, the choices made at the macroeconomic level become crucially important for the cyclical fluctuations in poverty.

Consider unemployment and policy toward it. All governments now provide some support for the unemployed. Support takes the form of a direct income transfer (unemployment insurance), some payments in kind, and help with finding alternative employment. If unemployment insurance can replace all the income lost by the unemployed without costly implications elsewhere, macroeconomic policy need not be concerned with the poverty implications of unemployment. However, although small changes in the rate of insurance (say from 45 to 50 percent of income loss) do not appear to cause serious disincentives, as the rate approaches 100 percent (full income replacement), massive withdrawal from work is to be expected. (See, for example, the reviews by Danziger and others 1981, and Hamermesh 1982. On the United Kingdom see the studies by Nickell 1979 and Atkinson and others 1984.) Thus this is one case in which either some other policy for compensating the poor needs to be found or poverty reduction needs to be considered as one of the goals of macroeconomic policy.

Sweden's policy of offering jobs to the unemployed should be viewed in this light. Currently, some 2–3 percent of the work force are in state-financed labor market programs. The United Kingdom also started its own more limited scheme, targeted mainly at youths, when unemployment rates increased in the early 1980s. Although such programs have some adverse effects—such as increasing the cost of labor to private employers by removing some of the unemployed from the market—their disincentive effects are not as prohibitive as full income replacement would be (for an evaluation of Sweden's programs see Calmfors and Forslund 1990). As antipoverty programs, however, state-financed labor market programs for those who are able to work are as effective as transfer programs.

For groups of the population not expected to work, transfer programs are a more effective way of dealing with their poverty than labor market programs. The most important groups in this category are the elderly, the disabled, and mothers of very young children. Transfers do have a disincentive effect for these groups; if pensions were eliminated, for example, labor participation rates among the elderly would certainly be much higher than at present. But the cost of such disincentives is politically acceptable, because society has adopted the view that transfer-financed retirement is a right for all individuals. The main feature of the recent history of the transfer programs of the four countries under study is a large increase in the transfers to these groups that has either lifted them (just) out of officially measured poverty or has left them just below the line.

It has been argued by several commentators that most remaining poverty in the United States and elsewhere is concentrated in groups that do not have easy access to the labor market. The implication drawn from this claim, for example by Danziger and Gottschalk (1986), is that economic growth is not likely to contribute as much to eliminating poverty in the future as it did up to the early 1970s. Notwithstanding this claim, in the long run economic growth is the best weapon against poverty. The taxes needed for redistribution are more easily raised when average incomes are rising than when they are static. The claim by Danziger and Gottschalk and others should be taken to imply that although in the future economic growth alone cannot reduce poverty as much as it did in the past, economic growth with redistribution remains the best weapon against it.

Although the changing composition of poverty has some implications for the optimal design of antipoverty policy, the evidence and arguments examined in this article have shown that cyclical fluctuations in economic activity still influence the incidence and extent of poverty. For these "cyclical" poor, better economic performance is indeed a solution. In the absence of cyclical stability, the best approach is first to identify which demographic groups are likely to suffer most in recession and then to devise compensating policies for them with minimum disincentives. The elderly, the disabled, and single mothers of young children are clearly not the target groups for antipoverty policy in recession. The target groups are those who suffer most in recession: the unemployed and the workers in jobs with unprotected wages (for example, those in the secondary

labor market). The corresponding demographic groups are youths, unskilled workers, and women without regular work patterns (see Gramlich and Laren 1984, and Ellwood and Summers 1986).

If recession cannot be avoided, there cannot be complete protection from unemployment and wage reductions. Thus choices made at the macroeconomic level, such as the United Kingdom's high unemployment policy or Australia's recent (1986–87) policy of wage restraint, have implications for poverty. In such cases, what are the main factors for the design of policy specifically aimed at reducing the poverty of those affected by recession? A minimum level of support, say up to the current level of about 50 percent of income loss, may be provided by unemployment insurance. Small changes in the rate of benefits at these levels do not appear to produce substantial disincentives. What is more important for the disincentives of unemployment insurance at these levels is not the precise rate but the duration of benefits and the ease with which they can be obtained. Thus unemployment durations are shorter in countries where benefits run out after a certain period, such as in the United States, than in countries where some kind of benefit is available indefinitely, such as the United Kingdom (where unemployment benefits run for one year, after which a means-tested income support is available). Long unemployment durations are undesirable, not only because of their effect on family income and assets, but also because they may erode the work ethic and the worker's human capital. Thus indefinite unemployment benefits, even at low levels, may not be a desirable policy.

If unemployment benefits should not last forever, is there a replacement policy for long durations? One possibility, of course, is to let the long-term unemployed sink into poverty: the threat of poverty may ensure that they do find work before the benefit runs out. In the United States many do find jobs before reaching long unemployment durations, but there are also many, especially minority youths, who do not. Sweden's example has shown that there are viable alternatives to unemployment insurance for long durations: job creation by the government for the unemployed. The disincentive from this scheme is not reduced overall labor supply, as with unemployment insurance, but more scarcity of labor for private enterprise. Calmfors and Forslund (1990) show that labor programs increase the cost of labor to private employers for given unemployment. But because the government scheme offers employment to workers already unemployed, the cost takes the form of a smaller reduction in the real wage associated with a given fall in private employment. This cost does not appear to be too high in Sweden. If a job guarantee is available to the long-term unemployed, ending unemployment insurance when the guarantee comes into effect becomes a more acceptable policy. Similar arguments hold for youth employment programs. Indefinite subsidization of unemployed youths is an undesirable policy. They are at an age in their work horizon when they need to learn skills and start regular career patterns. Many governments, most recently the United Kingdom, subsidize training programs for youths. Such policies are attractive substitutes to unemployment insurance, both for the youths undergoing them and for the firms employing

them. They need not be more costly to governments than the unemployment insurance programs that they replace.

Thus effective antipoverty measures for the unemployed exist. The combination of unemployment insurance for a while, to help while the unemployed place themselves in jobs, combined with a job guarantee for those who do not succeed and job training for youths, appears both feasible and desirable. What of low wages? This is in many ways easier to deal with than unemployment. For a start, low wages are not as serious a cause of poverty as total loss of income. Also, countries have elaborate systems of taxation with details of earnings during long periods for each individual. Redistributive taxation is an obvious solution to the problem of poverty caused by low wage earnings. A negative income tax, for example, long advocated by Milton Friedman and others, is an effective tool, and one that is easy to administer, for maintaining incomes above certain policy-determined levels. Means-tested benefits, as currently practiced in the United Kingdom, are more difficult to administer and less effective in reaching those eligible than a negative income tax would be.

The policies outlined so far are policies that take the country's institutional environment as given. The discussion of wage determination, however, has shown that institutions do matter in determining the economy's adjustment path. Cyclical unemployment is less of a problem in a centralized economy such as Sweden's or a decentralized one such as the United States' than in a unionized decentralized economy such as the United Kingdom's and Australia's. Some attempts at more corporatism in the latter two countries have succeeded, with good results for the labor market. Australia in particular often achieves more corporatist policies, with more flexibility, as in 1986–87, when unions agreed to wage reductions on the understanding that there would be more investment for job creation. The United Kingdom too has an example of a briefly successful "social contract" in 1976–77. More recently the United Kingdom has tried to move in the opposite direction, toward less centralization. Again this policy has had some success in increasing the flexibility of real wages, but it appears that this success was bought at the cost of increased poverty: unemployment has been very slow to recover after a big initial rise, and the real wages that have fallen are those at the bottom end of the wage distribution. On the whole, institutional reform in the United Kingdom has not been successful in changing the fundamental structure of the labor market.

In Australia reform has a better chance of success because of the existence of the Arbitration Commission, whose authority is respected by unions and employers. Sweden's example shows that if the Arbitration Commission is given more power in wage determination, the results can be good for employment. The general principle for institutional reform to emerge from the study of the four countries is that if a social contract of the form practiced in Sweden and the other Nordic countries is not feasible, a decentralized labor market with fewer institutional constraints is more likely to facilitate the recovery of employment from recession than one with more constraints. But for such reforms to operate

successfully for the low end of the income distribution, antipoverty policies of the kind described earlier are also necessary.

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Inequality and Poverty in China: Institutional Change and Public Policy, 1978 to 1988

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There is considerable uncertainty and debate about changes in poverty and living standards that are likely to occur in an economy in transition from centrally planned allocations to a more market-oriented basis, but a dearth of evidence and rigorous analysis remains. There is a tradeoff between policies that provide a guaranteed living standard with low inequality, albeit at a low income level, and systems that provide much higher monetary incomes, but create greater income variability and vulnerability, particularly during periods of high inflation. The Chinese experience following the economic reforms of 1978 highlights this dilemma, and our analysis strongly suggests the need for appropriate social safety nets if rapid growth is to be achieved without the poor and vulnerable bearing the costs of such growth.

Successive Chinese constitutions have guaranteed the fulfillment of basic needs to Chinese citizens. Despite changes in policy and leadership, an important continuing element in this guarantee has been the prevention of destitution and the protection of vulnerable groups—the "social security" that we will examine here.

In urban areas the permanent residence registration (*hukou*) provided guaranteed employment, access to rationed essential consumer items, and eligibility for an enterprise-based labor insurance system (*danwei*) that included health care, retirement, and disability provisions. Until recently, the system was maintained by strict controls on urban registration and migration.

In rural areas land reform provided households with access to productive assets, and assets were distributed fairly equally within regions. Although the rural guarantee has been subject to local interpretation, severe deprivation was generally avoided (except during the famine of 1959–61) through a system of transfers to the poorest regions. Minimum nutritional intake, shelter, basic

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health care, and education were generally achieved, although cash incomes were low (see Ahmad and Hussain 1991). Individual or household poverty was not a major concern of policymakers; rather resources were directed to areas deemed "poor." Thus, since the People's Republic was established in 1949, China has achieved remarkable improvements in welfare relative to other low-income countries by providing social services to the vast majority of its citizens. Although they were successful in many ways, the institutional arrangements, particularly during the 1970s, were not conducive to initiative, innovation, and growth.

As part of a dramatic policy reform package intended to improve economic incentives, in 1978 collective agriculture was dismantled, and China reverted to family farming under the "contract responsibility system." To stimulate agricultural production, government procurement support prices were raised substantially in three consecutive years starting in 1979 and were maintained at relatively high rates through 1987. Average real per capita net income for rural residents doubled during 1978–88, and agricultural output grew at an annual rate of 6.2 percent between 1979 and 1988, in contrast to the 2.7 percent rate of 1953–78. The reforms also were followed by a striking growth in township and village enterprises (TVEs), which by 1987 employed 87 million workers, compared with around 100 million employed by the state-owned enterprises (SOEs). Although workers in SOEs are covered by an extensive formal social insurance system, this is not true of TVEs or much of the non-SOE urban sectors. Such workers need to rely on employment opportunities for immediate sustenance and on extended family support, based on joint residence, in case of need. TVE production grew from about 3 percent of agricultural output in 1978 to 10 percent by 1987 (State Statistical Bureau annual-1988, pp. 34, 257–58). Despite reforms of the social insurance system, which relieved enterprises of the responsibility for retirees by extending pooling within localities or regions, institutional change has been fairly limited for SOEs.

The contract responsibility system also was extended to the nonagricultural sector, which allowed private and foreign-owned enterprises to operate alongside the SOEs and collectives. The urban employment guarantee was ended when the labor contract system was enforced on a nationwide basis in 1986, and legal provisions for bankruptcy (even of the SOEs) were created. Because of the food rationing system in the urban areas, the food price increases did not hurt residents with *hukou* rights, and the real average per capita expenditure of urban residents increased by 87.6 percent from 1978 to 1988 (State Statistical Bureau 1989a, p. 11) albeit at the expense of increasing budgetary subsidies on consumer goods.

Despite the increases in the average output and income of Chinese citizens since the reforms, the gains have not been evenly distributed, and urban residents without rations and rural net consumers were hurt by the price changes. In addition, disparities in rural areas, which have always existed (Ahmad and Zou 1989), have been exacerbated as a result of the reform, with the irrigated coastal

areas benefiting relatively more than others. This factor and the general relaxation of controls on residence and travel have led to the reappearance of rural-urban migration. Popular estimates of the urban "floating population" (as such migrants are called) range to 50 million. These migrants are not eligible for rationed goods and generally have no access to *danwei* (work unit) housing. Moreover inflation, which had averaged less than 3 percent in the 1970s and around 6 percent from 1980 to 1987, increased to around 20 percent a year in 1988, adversely affecting the poor and fixed-income groups. The State Statistical Bureau reported a decline in real income for 8.6 percent of urban households in 1986, 20.8 percent in 1987 (annual-1989a, p. 57), and 35 percent in 1988 (1989b).

From the policy point of view, China is caught in something of a dilemma. Although income was low under the pre-1978 system, inequality was also very low (especially at the local level, although regional differences existed), basic consumption needs were generally met through considerable public provision, and social indicators were at levels commonly achieved by high- and middle-income countries. Since the reforms, mean incomes have increased dramatically (see appendix tables A-1 and A-3), but there has been a reduction in publicly provided goods, and since 1985 rural poverty appears to have increased. In urban areas the sharp increase in inflation after 1987 also reversed the prior decline in poverty, although systemic changes since 1983 make comparisons with the earlier period somewhat problematic. In many areas the social safety mechanisms that had been built on a collective basis are no longer operative. This increases the likelihood of destitution and poverty, not only in the poorer regions, but also within relatively prosperous areas. Poverty reduction programs, however, provide transfers to poorer regions, not to poor households through individual entitlement (see, for instance, State Council 1987). Thus to measure the extent of poverty and inequality, we cannot assume that all individuals in a poor region are poor and must look at household-level income in both poor and relatively well-off areas.

Section I reviews changes in poverty and other indicators of living standards, and Section II reviews changes in inequality. Section III outlines those aspects of public policy that have relevance for our analysis of inequality and analyzes household-level data and the regional aspects of these data. Section IV presents final remarks summarizing our findings.

I. Poverty and Living Standards in a Decade of Reform, 1978–88

In this section we juxtapose official estimates of rural poverty with alternative figures derived from other sources. To examine overall changes in living standards and poverty we use information from the *Statistical Yearbook* (State Statistical Bureau annual) and other government reports. Household-level observations from a 1985–86 survey (from the Chinese Academy of Social Sciences) are used to examine regional patterns.

Official Estimates of Poverty

There are two official estimates of poverty in China. The first, by the State Council (1989), defined rural inhabitants with per capita nominal net income below 200 yuan (Y200) as poor, and those with income below Y150 as extremely poor (defined in Chinese as *jihan jiaopuo*, or "those who cannot dress warmly and eat their fill"). The Y200 figure was roughly 50 percent of mean rural income; the countries belonging to the Organisation for Economic Cooperation and Development similarly use 50 percent of average income as a poverty line. The use of a nominal figure to estimate poverty changes across sectors and over time is problematic, especially since relative price changes have been accelerating in recent years. In addition various groups in the urban population have had differing access to subsidized and rationed goods, a pattern that has also been changing over time. Thus, although cash incomes are perhaps easier to identify in China than in some other developing countries, they clearly do not reflect actual changes in living standards. If such nominal poverty lines are used, even if adjusted for some national rate of inflation, comparisons over time and across groups and regions are biased because they do not account for differences across regions and groups within regions. A common error is to apply the Y200 poverty line to the period before reform, when cash incomes clearly did not fulfill basic needs (see Ahmad and Zou 1989).

A State Council report suggests that by the end of 1985, there were 102 million rural residents with per capita incomes below Y200, equal to about 12.2 percent of the rural population (State Council 1989, pp. 1–2). Among them, the 38.4 million poorest, or about 4.4 percent of the rural population, lived in 664 out of the 1,936 counties. According to this report, these poor are concentrated in 18 regions in middle and western China. It is not clear whether the method used was to examine the distribution of all households across all regions and then to apply the poverty cut-off point, or whether "poor areas" were identified first and then the entire population of these districts was assumed to be poor. Using the regional classification, however, the central government, together with the provinces and autonomous regions, targeted 678 counties for public works projects amounting to Y4 billion. Of these, 328 counties were on the list of the central government, with 43 percent in minority (non-Han peoples) areas.

A second official source of estimates is the *Statistical Yearbook of Rural Areas of China* (State Statistical Bureau 1985a, 1987), which provides information on the number of recipients of government relief funds and the recipients as a percentage of the total number of the poor. It does not detail, however, the criteria used to define the "poor." The numbers of poor in rural areas calculated from this information were 65.8 million in 1978, 65.3 million in 1983, 96.5 million in 1985, and 102.3 million in 1986. The number for 1985 is close to the State Council estimates, which suggests that the Y200 cut-off point has been used. Recipients of relief funds increased from 30 million in 1978 to 40 million in 1986, but formed a decreasing proportion of the poor after the 1983 reforms

ɔm 54 percent in 1983 to 40 percent in 1986), which reflects the contraction ;ocial security coverage.

There is no official Chinese estimate for urban poverty, which suggests that :horities have seen poverty very much as a rural and regional phenomenon.

Poverty Lines

Counting the number of poor below a given poverty line fails to measure the ensity of poverty and thus changes in the positions of those below the line. rther the choice of a line may be based on criteria, such as minimum levels of trition, income, or expenditures, the setting of which requires some degree of ıjecture and normative decisions. Income itself may not reflect real living ndards when some goods and services are provided without cost or at differ- : subsidized prices. Further, where intertemporal comparisons are concerned, : choice of the appropriate deflator may make a considerable difference in the verty line found. Thus the use of a single "absolute" poverty line may be ›blematic.

With these caveats in mind, we examine the bases for several alternative verty lines as a first step in our analysis. For both rural and urban areas we :e two given poverty lines. To be consistent with the State Council estimates rural areas for 1985, we first use annual per capita income of Y200 to ›resent rural poverty and Y150 to capture extreme deprivation. The general lex of retail prices does not adequately reflect an average rural consumption sket since it includes prices of items, such as fertilizers, that are not consumed ectly. However, we use it in the absence of a more satisfactory deflator. To set overty line for urban areas, we took Y375, or slightly above half of the urban an per capita income of Y682, in 1985. For sensitivity, a lower line of Y300 s also assumed. The general cost of living index for staff and workers was :d as the urban deflator. The retail price and cost of living indexes used are :rages of the plan prices of state-owned commercial units, negotiated prices, 1 open-market prices, weighted by the actual value of sales or purchases at ferent prices (table 1). This first set of poverty lines, adjusted for changing ces, could be taken to measure changes in "absolute poverty."

A second set of lines is constructed relative to mean income in each year: for ɔan areas we calculate annual poverty lines at 50 percent of mean income and rural areas at 35 and 50 percent. Using these poverty lines, if a small ›portion of households experienced very rapid rises in income while the in- ne of the great majority of households changed little, this would increase :rage income, the poverty lines, and the proportion of households that fell ow those lines. Such lines could be taken as representative of "relative verty."

An alternative, a poverty line based on level of nutrition, requires information consumption patterns and the price at which purchases are made. For exam- , in urban areas different price indexes would be needed for households with 1 without access to rationed goods. Similarly, many households in poor rural

Table 1. *Alternative Poverty Lines in China, 1978–88*
(yuan per capita per year)

Poverty line	*1978*	*1980*[a]	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*
Rural									
1985 State Council lines adjusted for inflation[b]									
Y200: poverty	156	169	176	179	183	200	212	228	270
Y150: extreme deprivation	117	127	132	134	138	150	159	171	203
Share of yearly mean income (percent)									
50	67	96	133	155	178	199	212	231	273
35	47	67	95	108	124	139	148	162	191
Urban									
1985 absolute poverty lines adjusted for inflation[c]									
Y375	279	314	320	327	335	375	401	436	526
Y300	224	251	256	261	268	300	321	349	421
50 percent of yearly mean income[d]	158	229	247	263	304	343	414	458	560

a. 1980 figures refer to 1980 for rural and 1981 for urban areas.
b. Deflated using the retail price index.
c. Deflated by the general cost of living index of staff and workers.
d. Based on income available for consumption.
Source: Authors' calculations based on State Council (1987 and 1989) for rural poverty lines and State Statistical Bureau (1989a and annual) for urban lines.

areas obtain grain free or at low "resale prices" while others face relatively high "market" prices. Because such information is not available, we use several different expenditure-based poverty lines, including the official poverty line, without attempting to assign nutritional equivalence.

While the inflation-adjusted absolute rural poverty lines increase gradually from 1978 to 1988, the relative income-adjusted lines start at a much lower level and show a sharp rise after the reforms and a slower increase after 1985. This reflects the lower average income at the onset of the reform period and its dramatic increase during the decade. The choice of the "higher" urban poverty line for 1985 was intentionally taken as above the relative poverty line. However, with inflation and the increase in average nominal incomes, by 1987 the higher absolute poverty line had fallen below 50 percent of mean incomes. By the same token, the higher absolute line was above the "relative" poverty line for the entire period before 1984.

Public transfer payments in China have included rations, subsidies, and payments in kind. In rural areas the government stipulates a "basic consumption of grain" (*jiben kouliang*) and redistributes grain from surplus areas to poor and disaster-prone areas. Peasants in these areas obtain the "resale grain" free or at low prices. In urban areas the government provides low-priced rations of staple food and other consumer goods covering, at times as many as 77 items, including wheat flour, rice, other grains, edible oil, sugar, meat, eggs, cloth, cotton, matches, and soap. Ration coupons are distributed according to size of the household and the gender and age of the household members. Subsidies cover a wider range of commodities and services, including rental housing, public transportation, *danwei*-based child care and health services, and labor insurance

benefits for permanent employees of state enterprises. In Beijing subsidies accounted for around 60 percent of the municipal budget, which amounted to Y530 for each registered resident or around 50 percent of mean cash income (*China Daily* 1989b). These have made the standard of living considerably higher than that measured by cash income alone.

The transfer payments are unevenly distributed, especially between urban residents with *hukou* and others. Clearly, a higher cash income would be needed for individuals without *hukou* rights to achieve the same living standard as someone with *hukou* rights on the poverty line. Rough calculations suggest that the value of rationed grain alone may be around 25 to 35 percent of poverty-level income. Added to that is the value of subsidized housing and other commodities. It would not be surprising, therefore, if the poverty line for non-*hukou* holders were to exceed Y500 per capita in 1985 prices. The relative value of the subsidies would vary by location, especially in proportion to the scarcity of accommodation, so that in the major cities higher poverty lines are likely to be needed. Unfortunately the data do not permit us to differentiate between urban *hukou* recipients and the floating population.

It is estimated that Beijing's floating population numbered around 1.12 million in 1988–89, with 60 percent being migrant workers. Their numbers have increased about 23 percent a year, and they may now constitute one-sixth of Beijing's metropolitan population (*Zhonguo Xinwen She* 1989). Further, casual evidence suggests that the floating population in Chinese cities has grown to more than 50 million (*China Daily* 1989a). Although not all of these floating workers are poor, evidence suggests that most are and reinforces our unease with the use of poverty lines that do not account for this very large Chinese subclass.

Incidence of Poverty

We estimate the incidence of poverty by applying the poverty lines from table 1 to the household distribution from the *Statistical Yearbook* (State Statistical Bureau annual-1988, 1989) for peasants and the urban population (table 2; see tables A-1 to A-3 and A-5 for its derivation). There is some controversy about the size of the rural population (see table A-4), and we also use an alternative rural-urban breakdown from the United Nations to derive alternative poverty estimates (table 3). Additional sensitivity is provided by using household level survey data for 1985–86 (table 4).

The State Statistical Bureau did not break down rural income below Y100 or over Y500, so the distributions for peasants are truncated at the lower end for earlier years and at the upper tail for more recent years. Thus, for 1978, 65 percent of the households are in the two lower groups, and, for 1988, the top two groups account for 53 percent of the households. Consequently, the assumptions concerning distributions within groups are likely to be important in estimating poverty as well as inequality. Group means also are not known, although the overall sample mean is given. This makes the estimation of inequality literally subject to assumption (as discussed below). The urban distributions

Table 2. *Estimates of the Incidence of Poverty in China, 1978–88*

Poverty line	*1978*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*
Rural									
1985 State Council line (Y200) adjusted for inflation									
Households (percent)	65.1	44.3	19.1	14.9	16.0	12.3	13.9	13.1	14.8
Population (percent)	—	—	—	—	—	13.6	—	14.4	16.12
Persons (millions)	—	—	—	—	—	90.8	—	83.9	89.5
1985 State Council line (Y150) adjusted for inflation									
Households (percent)	44.1	22.6	7.9	5.6	7.5	4.4	5.6	5.3	5.7
Population (percent)	—	—	—	—	—	5.0	—	6.0	6.34
Persons (millions)	—	—	—	—	—	33.4	—	35.0	35.2
50 percent of mean incomes									
Households (percent)	22	—	8.3	7.6	14.3	12.1	13.4	13.7	15.2
Population (percent)	—	—	—	—	—	13.4	—	14.9	16.6
Persons (millions)	—	—	—	—	—	89.6	—	87.0	92.0
35 percent of mean incomes									
Households (percent)	15.7	—	2.7	2.5	5.2	3.7	4.3	4.4	4.7
Population (percent)	—	—	—	—	—	4.1	—	5.0	5.3
Persons (millions)	—	—	—	—	—	27.5	—	28.9	29.4
Urban									
50 percent of mean incomes									
Households (percent)	—	1.96	1.35	1.75	2.02	9.02[a]	5.60[a]	6.71[a]	7.77[a]
Population (percent)	—	—	—	—	—	11.92	—	7.92	9.12
Persons (millions)	—	—	—	—	—	45.6	—	39.4	49.3
Y375 adjusted for inflation									
Households (percent)	—	11.2	8.9	8.1	4.7	9.87[a]	5.42[a]	5.30[a]	7.29[a]
Population (percent)	—	—	—	—	—	13.03	—	6.24	8.57
Persons (millions)	—	—	—	—	—	49.8	—	31.1	46.3
Y300 adjusted for inflation									
Households (percent)	—	3.05	1.91	1.66	1.50	7.89[a]	4.33[a]	3.52[a]	5.84[a]
Population (percent)	—	—	—	—	—	10.43	—	4.17	6.86
Persons (millions)	—	—	—	—	—	39.9	—	20.8	37.1

—Not available.

a. These figures are not comparable with those of previous years because of the regrouping of the data from the State Statistical Bureau (1989a); see table A-3 for details.

Source: Authors' calculations based on data given in State Statistical Bureau (annual-1988), p. 716, and (1989a), pp. 350, 352, 462, and 465; see tables A-1 to A-3 and A-5.

Table 3. *Incidence of Poverty in China Using U.N. Population Estimates, 1985, 1987, and 1988*
(millions)

Poverty line	*1985* Adjusted for household size	*1985* Unadjusted for household size	*1987* Adjusted for household size	*1987* Unadjusted for household size	*1988* Adjusted for household size	*1988* Unadjusted for household size
Rural						
Y200 adjusted for inflation	Y200 / 113.4	102.6	Y228 / 123.1	112.0	Y270 / 139.5	128.0
Y150 adjusted for inflation	Y150 / 41.7	36.7	Y171 / 51.3	45.3	Y203 / 54.9	49.3
50 percent of mean income	Y199 / 111.8	100.9	Y231 / 127.3	117.1	Y273 / 143.6	131.5
35 percent of mean income	Y139 / 34.2	30.9	Y162 / 42.7	37.6	Y191 / 45.9	40.7
Urban						
50 percent of mean income	Y343 / 25.8	19.5	Y458 / 17.9	15.2	Y560 / 21.1	18.0
Y375 adjusted for inflation	Y375 / 28.2	22.3	Y436 / 14.1	12.0	Y526 / 19.8	16.8
Y300 adjusted for inflation	Y300 / 22.6	17.1	Y349 / 9.4	8.0	Y421 / 15.9	13.5

Note: In the Chinese official estimates of the incidence of poverty, the household distributions are not adjusted for household size. Here the unadjusted 1985 rural poverty estimate coincides with the official figure of 102 million.
Source: Authors' calculations based on United Nations (1986), table A-1.

Table 4. *Estimates of Households and Individuals in Poverty from Cross-Sectional Data, 1985–86*
(percent)

	Poverty line		
	< Y300	< Y350	< Y400
Urban			
Individuals	13	15.2	17.8
Households	5	7	9.6
Rural	< Y200	< Y250	< Y300
Individuals	8.1	16.1	28.6
Households	7.6	15.2	27.8

Source: Authors' calculations based on the 1985–86 unpublished household survey data tapes.

were not truncated (see table A-3), but in 1984 urban households were regrouped, and a great number of rural townships were reclassified as urban so that rural and urban data for before and after 1984 are not strictly comparable. Although the estimates based on UN population data for 1985–88 are more comparable, it is not clear whether nonmonetary transfers are adequately reflected therein, so that only comparisons for recent years are likely to be valid.

Headcounts corresponding to the poverty lines of table 1 are presented in table 2. All poverty lines show a decline in poverty during 1978–83, with the inflation-adjusted equivalent of Y200 per capita showing the most precipitous drop from 65 percent of the rural households in 1978 to less than 15 percent by 1983. The figure of 65 percent in poverty reflects cash income, but before 1983 there were considerable transfers in kind, so that this does not reflect living standards, which were already as high as those in middle-income countries by the mid-1970s (Ahmad and Hussain 1991, and table 5). The poverty index based on 50 percent of mean income, however, suggests a drop in income poverty from only 22 percent of households to 7.6 percent in 1983.

Chinese official estimates (State Council 1989, State Statistical Bureau 1985a) do not correct for varying household size and use a higher figure for total rural population (870 million for 1985), rather than the 665 million given by the State Statistical Bureau. Using the UN population projections does not greatly affect directions of change in poverty or the overall incidence of poverty, but the number of poor in rural areas is higher, with fewer urban poor (see table 3). All the headcount measures suggest an increase in poverty and destitution after 1983–84, following national adoption of the Responsibility System, when some disruption would be expected. During 1985–88 the share of rural households and the rural population in poverty increased substantially according to both State Council lines, possibly because of the stagnation of agricultural production and the acceleration of inflation after 1985.

Given the changed definition of urban areas since 1985, the headcount measures for 1981–84 are not strictly comparable with those for 1985–88, but the poverty line based on 50 percent of mean income suggests an increasing trend in

each period. However, adjusting the fixed (1985) poverty lines for price changes leads to a decline in the first period, but an increasing trend since 1985. The increase in urban poverty is particularly marked in 1988 relative to 1987. This is strongly correlated with the inflationary trends that have adversely affected urban fixed-income groups, such as pensioners.

Rural and urban incomes and poverty for 1985 are compared in figure 1. A larger share of the rural population appears at the lower income levels. For the poverty lines chosen (Y200 in rural areas and Y375 in urban areas), the incidence of urban poverty is somewhat higher. If the urban poverty line (Y300) is chosen, the incidence would be less than for Y200 in rural areas, but greater than for Y150. The data from the State Statistical Bureau exclude the floating population, and in the analysis above it has been assumed that such households have the same income distribution as those with *hukou* rights. Most evidence suggests that the floating population is more concentrated at the lower end of the income scale, however, so that true urban poverty would be higher than the estimates here.

Additional cross-section evidence on poverty has been obtained for both rural

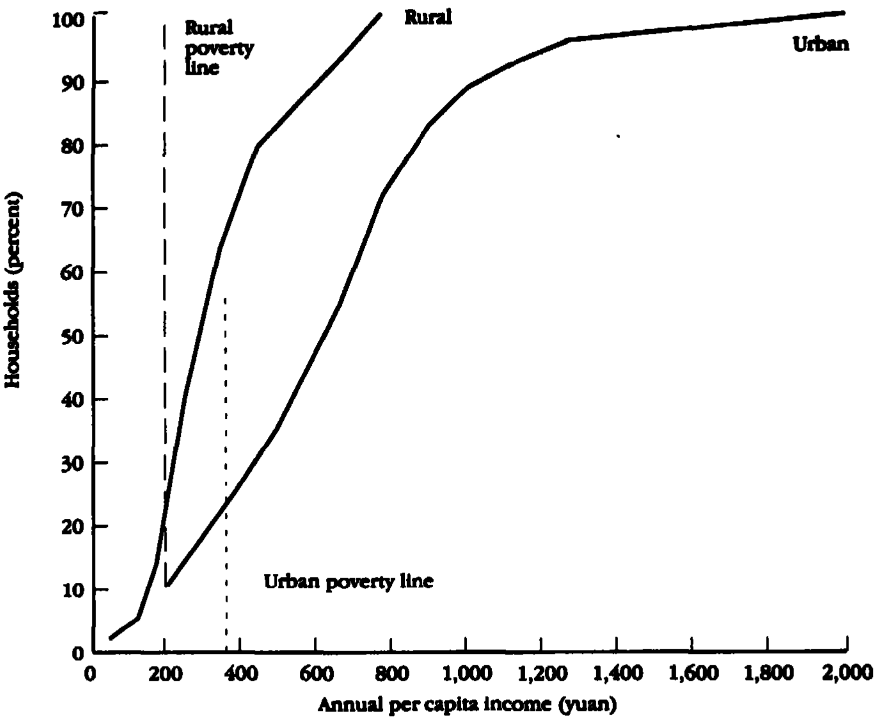
Table 5. *Infant Mortality and Life Expectancy at Birth in China, 1950–86*

	Infant mortality rate (per thousand live births)			*Life expectancy at birth (years)*	
Year	*Official*	*Estimated*		*Official*	*Estimated*
1950		265		35	30.5
1954	138.5	236			34.1
1956	81.1				
1957	70.9	229		57	34.8
1958	80.8				
Cities	50.8				
Counties	89.1				
1959	88.3	208			37.7
1963	83.6	137			49.0
1973–75	47.0	96			57.3
Male	50.1				
Female	43.7				
1975	27.1				
1978	22.3	65			64.2
1981	34.7	44		67.9	
Male	35.6	45		66.4	65.8
Female	33.7	43		69.4	68.7
1986	34.0	51		69.05	
Cities	15.4	20	Male	67.3	
Counties	38.5	59	Female	70.7	

Note: Bannister (1989) quotes some Chinese authors' work, which reported under-sampling of the areas with high infant mortality rates in the 1987 survey on children.

Source: Official infant mortality rates: for 1954–81, Wang (1988) p. 37; for 1986, State Statistical Bureau (1989c), p. 417–19. Estimated rates: through 1978, Jamison and others (1984), p. 5; and, for 1981 and 1986, Hao, Arriage, and Banister (1988) and Banister (1989). Official figures for life expectancy at birth: for 1950, State Statistical Bureau (1989a), p. 109–10; for 1957, a survey conducted in 11 provinces; for 1981, the third population census conducted in 1982; and, for 1986, the 1 percent survey conducted in 1987. Estimated rates: through 1978, Jamison and others (1984), p. 5; and, for 1981 and 1986, Hao, Arriage, and Banister (1988) and Banister (1989).

Figure 1. *Cumulative Distribution of Income in Rural and Urban Households, 1985*



Note: Since the group mean incomes are not given, we take the mid-point of the interval as the mean income for each household group.
Source: State Statistical Bureau (annual - 1989), pp. 726 and 742.

and urban areas for 1985–86 from household-level data. Table 4 presents six alternative poverty lines for rural and urban areas and the proportions of households and individuals below these levels. No attempt has been made to adjust the provincial samples relative to the national population. Adjusting the Y200 rural poverty line for inflation results in a line of Y212 for 1986, so that the actual 1985–86 incidence in rural areas should be closer to that shown for Y200 than for Y250. For urban areas the inflation-adjusted Y375 base is Y401 for 1986, so that the comparison of figures from table 2 should be made with the results of the <Y400 line. The cross-section estimates thus are roughly the same orders of magnitude as are our estimates using data from the State Statistical Bureau in table 2.

Other Indicators of Living Standards

Although evidence on living standards indicates that life expectancy at birth has steadily improved (State Statistical Bureau 1989a, pp. 109–10), this is a

relatively stable measure reflecting long-term trends. The infant mortality rate, however, is much more sensitive to short-term fluctuations. It is often taken as a comprehensive indicator of living standards since it reflects the nutritional status of women, health care facilities, access to clean water, sanitary conditions, and so on. In China the infant mortality rate increased substantially during 1958–62 and since the reforms (see Hussain and Stern 1988), while life expectancy was relatively unchanged (see table 5). Both life expectancy and infant mortality levels had reached middle-income standards by the early 1970s.

The reforms have led to a decline in the local collective resources that had been used to provide preventive health care and the public hygiene network in rural areas. Alternative financing mechanisms have been slow to develop. The infant mortality rate appears to have increased recently, as seen in estimates for 1986 (Jamison and others 1984), and official figures (State Statistical Bureau 1989a). Evidence of the rise in the rate alarmed the government sufficiently to induce it to introduce a nationwide inoculation program, in conjunction with UNICEF, to cover at least 90 percent of infants by 1991 (Ahmad and Hussain 1991).

The original delivery mechanisms of medical and educational services have been under severe stress since the 1980s. The problems with preventive care are apparent in the case of snail fever. Although this had reportedly been eradicated, it is now estimated that there are 1 million patients affected (World Bank 1989, p. 9–12). Altogether there are now 60 million sufferers from various endemic diseases, with 500 million potentially threatened (*China Daily* 1989c). Policies and new mechanisms to provide social services and safety nets for the vulnerable groups in a period of economic transition are needed, often with support from international agencies.

II. Inequality in China

Measuring changes in living standards through the use of poverty lines is not very enlightening because of both the existence of subsidies and rations and the inability of such measures to reflect changes in the extent and distribution of poverty among those below the line. For the latter purpose, inequality measures that are sensitive to transfers at the lower range of the income distribution are preferred to the headcount index. Poverty measures such as the Foster-Greer-Thorbecke class are sensitive to the intensity of poverty, but they also are subject to the problems inherent in the choice of a poverty line. We use here two variants of the Atkinson index of inequality, which reflect the degree of inequality aversion through the value assigned to a parameter, e. This parameter could be varied from 0 to infinity. With $e = 0$, a unit of income to the poorest would be equivalent to a unit to the richest, regardless of income levels. We set e equal to 2 and 5 to reflect relatively high degrees of inequality aversion. With $e = 2$, the Atkinson index weights the welfare of poor individuals 32 times more heavily than that of another with twice the income. A value of $e = 5$ is often used to express maxi-min or Rawlsian preferences. If the gap between the wealthiest and

Table 6. *Estimates of Rural Income Inequality in China under Differing Distribution Assumptions, 1981 and 1987*

	Coefficient of variation		*Gini coefficient*		*Atkinson index*[a]			
					$e = 2$		$e = 5$	
Distribution assumption	*1981*	*1987*	*1981*	*1987*	*1981*	*1987*	*1981*	*1987*
Group mean income unknown								
Households are concentrated at lower bounds of income groups	0.365	0.324	0.172	0.180	0.102	0.144	0.227	0.426
Households are concentrated at upper bounds of income groups	1.219	2.089	0.342	0.386	0.557	0.478	0.904	0.929
Midpoint as group mean								
Households are concentrated at the mean of the income groups	0.470	0.440	0.247	0.243	0.231	0.240	0.566	0.659
Households are concentrated at the bounds of the income groups	0.483	1.455	0.266	0.306	0.405	0.297	0.889	0.637
Households are distributed evenly within income groups	0.475	1.010	0.260	0.285	0.290	0.284	0.809	0.849

Note: Indexes are based on data on the number of households in each income range, with the mean income and distribution in each range unknown. Only the population means are known.

a. e is the inequality aversion parameter.

Source: Authors' calculations based on State Statistical Bureau (1989a).

Table 7. *Estimates of Urban Household Income Inequality in China under Differing Distribution Assumptions, 1981 and 1987*

	Coefficient of variation		*Gini coefficient*		*Atkinson index*[a]			
					$e = 2$		$e = 5$	
Distribution assumption	*1981*	*1987*	*1981*	*1987*	*1981*	*1987*	*1981*	*1987*
Group mean income unknown								
Households are concentrated at lower bounds of income groups	0.216	0.335	0.099	0.179	0.042	0.097	0.108	0.217
Households are concentrated at upper bounds of income groups	1.080	0.780	0.262	0.283	0.202	0.313	0.395	0.713
Midpoint as group mean								
Households are concentrated at the mean of the income groups	0.517	0.578	0.221	0.255	0.167	0.201	0.435	0.444
Households are concentrated at the bounds of the income groups	0.850	0.657	0.248	0.259	0.196	0.247	0.444	0.679
Households are distributed evenly within income groups	0.679	0.614	0.239	0.258	0.177	0.216	0.438	0.565

Note: Indexes are based on data on the number of households in each income range, with the mean income and distribution in each range unknown. Only the population means are known.

a. e is the inequality aversion parameter.

Source: Authors' calculations based on State Statistical Bureau (1989a).

poorest 5 percent of the population was 15 times the income of the poorest, the Atkinson index would give a weight of 50,000 to the bottom 5 percent relative to the top 5 percent and in effect would focus almost exclusively on the bottom 5 percent. We also present measurements based on other commonly used indexes: the Gini coefficient, which is relatively sensitive to transfers among the middle ranges of the distribution, and the coefficient of variation, which is most sensitive to income changes among the rich (see Champernowne 1974 for a discussion of these indexes).

Given that the reported income ranges for each year have been fairly large and that the mean incomes are unknown, the calculation of inequality indexes requires some assumptions about the distributions. In table 6 we experiment with the effect on measures of inequality of five such assumptions about rural income distribution for 1981 and 1987. For instance when we assume that observations are clustered at the upper income bound, this generates a Gini coefficient of 0.34 for 1981 (a decidedly more unequal distribution than the estimate of 0.23 reported in table A-1). Assuming instead a grouping around the lower bound reduces the Gini coefficient to 0.17. When we assume that the midpoint of each group represents the group mean, this reduces the spread of the Gini estimates for 1981 for lower and upper clustering to 0.247 to 0.266. However, the rural income data ranges were overly aggregated at the lower (Y0–Y100 per capita) and upper (+Y500 per capita) ranges, and thus the underlying density-functions were truncated. Therefore one would not expect the distributions to remain constant or the midpoints to represent the group means.

The Atkinson indexes, which weight heavily changes in the income of the poor, show either improvement or deterioration in the position of the poorest from 1981 to 1987, depending on the grouping assumptions. For $e = 2$ under three of the five assumptions the index declines: the position of the rural poor improved relative to the mean. With $e = 5$, however, the index rises under four of the five assumptions, which suggests a relative deterioration in the position of the poorest.

Examination of the upper ranges of the size distribution, using the coefficient of variation, suggests sharp increases in inequality resulting from the presence of the relatively rich. For instance there is a sharp increase in the coefficient of variation (when the midpoint is assumed with linear interpolation). As expected, this increase is even higher when the crude upper bound assumption is adopted. It would be unrealistic to expect that all the rich would have been clustered at the lower bound.

The middle ranges of the size distribution show less change. The Gini coefficient is relatively unchanged for the lower bound assumptions, but increases marginally for the linear interpolation. This suggests that the bulk of the change in inequality results from changes among the relatively well off as well as the relatively poor in rural China.

There is less disagreement among the indexes for the urban sector, except for the coefficient of variation, which is most sensitive to changes in the top range of

Table 8. *Inequality in Rural Areas in China by Province, 1985–86*

	Households					Population				
		Coefficient of	Gini coefficient	Atkinson index[a]			Coefficient of	Gini coefficient	Atkinson index[a]	
Province	Number	variation		$e = 2$	$e = 5$	Number	variation		$e = 2$	$e = 5$
Beijing	189	0.69	0.25	0.24	0.80	711	0.37	0.20	0.12	0.27
Shanxi	290	0.55	0.27	0.20	0.47	1042	0.43	0.22	0.15	0.41
Heilongjiang	339	0.75	0.27	0.21	0.44	1351	0.62	0.25	0.18	0.40
Gansu	246	0.46	0.25	0.23	0.73	1125	0.48	0.25	0.24	0.76
Jiangsu	442	0.50	0.24	0.29	0.94	1705	0.44	0.24	0.34	0.95
Anhui	434	6.10	0.47	0.43	0.77	1947	6.46	0.51	0.45	0.53
Henan	551	0.65	0.28	0.25	0.68	2367	0.66	0.27	0.23	0.55
Hubei	425	0.52	0.24	0.19	0.71	1802	0.55	0.24	0.18	0.46
Guangdong	286	6.39	0.57	0.55	0.83	1305	6.27	0.56	0.52	0.63
Sichuan	625	5.93	0.42	0.39	0.85	2187	0.73	0.24	0.19	0.79

a. e is the inequality aversion parameter.
Source: Authors' calculations based on the 1985–86 unpublished household survey.

the distribution (table 7). The urban data suggest a smoother distribution, with less scope for varying assumptions concerning the underlying group distributions, although group means and distributions are still unknown. The two Atkinson indexes display sharp increases in 1987 relative to 1981, which suggests that increasing urban income concentration is due largely to the increased number of the very poor relative to the urban mean. There is no increased concentration at the upper end of the income scale, which is consistent with the relatively limited institutional changes in the urban enterprise sectors up to 1987. Subsequent increases would be linked to the spurt of inflation experienced.

The aggregate evidence presented above reflects increasing inequality, but it does not indicate why this has happened or who the poor are. Through the use of household level survey data for 1985–86, we examine below some evidence on why inequality has increased: the regional variations and sources of individual vulnerability.

III. Cross-Section Data on Inequality: Regions and Individuals

In this section we describe the regional and individual dimensions of poverty and vulnerability and attempt to describe who the poor were on the basis of household-level observations from the 1985–86 government survey. Identifying the poor puts in context the different policies that have been used by the state and those that might be necessary in the future.

The 1985–86 survey provides an important starting point in describing the poor, but it is subject to some limitations. Although the urban and rural samples are fairly large, 4,203 and 3,827 households, respectively, not all rural or urban areas have been sampled in proportion to their populations. The resulting estimates thus may be more representative of particular provinces rather than regions or of China as a whole. We also cannot estimate comparable regional poverty lines, because we lack province- and sector-specific price deflators. Further work in this area is necessary to generate reliable nationwide estimates. The inequality estimates are more solidly based, however, unless it can be shown that the group-specific rankings change with the use of alternative price indexes.

Regional Variation

Considerable variation in the incidence of inequality is evident among the ten rural areas sampled (table 8). Guangdong, with the second highest mean income in rural areas, has the greatest concentration of income in the upper and middle ranges of the size distribution. However, the Atkinson $e = 5$ index, which weights heavily extremely low incomes relative to the mean, is *lower* in Guangdong than in Jiangsu (a relatively rich province) and Sichuan (and than in Gansu—one of the poorest provinces) in per capita rather than household terms. Although income distributions in Gansu and Jiangsu are relatively alike in the middle ranges of the distribution, the poor in Jiangsu are relatively worse off in relation to the mean, as measured by the Atkinson indexes.

Table 9. *Inequality in Urban Areas in China by Province, 1985–86*

	Households					Population				
		Coefficient of variation	Gini coefficient	Atkinson index[a]			Coefficient of variation	Gini coefficient	Atkinson index[a]	
Province	Number			$e = 2$	$e = 5$	Number			$e = 2$	$e = 5$
Beijing	136	0.47	0.24	0.27	0.79	552	0.57	0.31	0.58	0.86
Shanghai	68	0.46	0.27	0.46	0.87	382	0.78	0.44	0.77	0.90
Tianjin	379	0.48	0.23	0.25	0.84	1511	0.55	0.28	0.61	0.91
Hebei	156	0.47	0.23	0.51	0.95	686	0.62	0.32	0.71	0.94
Shanxi	141	0.49	0.25	0.24	0.62	651	0.51	0.28	0.27	0.60
Inner Mongo	54	0.54	0.24	0.23	0.68	229	0.50	0.22	0.21	0.67
Liaoning	237	0.38	0.21	0.15	0.39	836	0.37	0.20	0.15	0.40
Jilin	170	0.47	0.23	0.44	0.94	716	0.52	0.28	0.76	0.95
Heilongjiang	144	0.56	0.28	0.42	0.88	704	0.70	0.36	0.58	0.86
Shaanxi	191	0.48	0.25	0.54	0.98	828	0.61	0.33	0.91	0.99
Gansu	201	0.43	0.24	0.21	0.64	793	0.45	0.24	0.23	0.65
Ningxia	22	0.38	0.21	0.47	0.88	106	0.39	0.21	0.46	0.88
Qinghai	106	0.59	0.23	0.21	0.60	461	0.46	0.22	0.27	0.68
Xinjiang	81	0.57	0.30	0.49	0.91	427	0.80	0.43	0.77	0.93
Shandong	169	0.42	0.23	0.38	0.92	633	0.43	0.23	0.38	0.92
Jiangsu	119	0.36	0.19	0.25	0.88	412	0.35	0.19	0.27	0.88
Anhui	94	0.39	0.20	0.15	0.46	364	0.42	0.22	0.17	0.46
Zhejiang	84	0.45	0.24	0.19	0.50	309	0.46	0.24	0.19	0.52
Fujian	108	0.43	0.24	0.37	0.83	428	0.45	0.25	0.42	0.84
Jiangxi	170	0.42	0.21	0.18	0.62	691	0.41	0.21	0.18	0.62
Henan	112	0.46	0.24	0.35	0.88	526	0.64	0.34	0.65	0.91
Hubei	219	0.40	0.21	0.17	0.61	839	0.39	0.21	0.18	0.61
Hunan	114	0.46	0.24	0.24	0.76	514	0.56	0.30	0.49	0.83
Guangdong	152	0.43	0.23	0.21	0.66	601	0.43	0.23	0.20	0.61
Guangxi	120	0.45	0.23	0.27	0.75	520	0.60	0.32	0.57	0.83
Sichuan	343	0.51	0.25	0.30	0.88	1287	0.55	0.28	0.58	0.92
Guizhou	96	0.49	0.24	0.19	0.59	388	0.49	0.24	0.20	0.61
Yunnan	217	0.42	0.22	0.28	0.89	794	0.42	0.22	0.31	0.90

a. *e* is the inequality aversion parameter.

Source: Authors' calculations based on the 1985–86 unpublished household survey.

The survey indicates that the poor are more likely to be the elderly without extended-family support, the incapacitated or sick, and those who have suffered from an interruption of earnings, possibly because of weather or seasonal variations. Transfers in response to geographical concentrations of poverty thus are still appropriate in the period after reform, although migration provides a measure of protection that was not available earlier. The substantial number of poor in the richer provinces illustrates, however, that geographical targeting is unlikely to reduce poverty. The poor in rural areas such as Gansu face relatively low income-generating prospects from agricultural activities, and, given that many of these areas are somewhat inaccessible, prospects for migration are limited. This suggests the need for improvements in infrastructure (irrigation and roads) and in education and training, as well as employment generation and support for the poorest.

As in the rural areas, patterns of inequality differ across China's cities. Guangdong, for example, has the highest mean income levels in the sample from the 1985–86 household survey but appears to have relatively low inequality (table 9). But Shanghai and Beijing, which rank third and second, respectively, in average per capita income, displayed relatively high inequality.

Shanghai has the most mature demographic profile of any city in China, with a greater proportion of the elderly than others: 1.71 million aged 60 and over, out of a total population of 12.5 million. A survey of the aged in Shanghai in 1987 (Chen 1987) suggested that the extremely old, or those above 70, formed 38 percent of the aged. It also found that 30 percent of the aged had annual incomes below Y480, 42 percent below Y720, and almost 70 percent below Y1,080. Given that old age pensioners often live with a spouse or helper, a pension of Y1,080 a year may well imply a per capita income of Y540. Pensions are linked to standard wages at the time of retirement, with little adjustment for inflation. The 70 year old (and above) would have retired around 1978 (the Cultural Revolution discouraged retirement) at a relatively low income level. Thus it would appear that many of those at the lower end of Shanghai's income distribution are the elderly. Since unemployment insurance does not extend to the informal sector in China, the floating population or those looking for work could also form part of Shanghai's poor.

Identification of the poor may also result from comparisons between Gansu, one of the poorest provinces, and Jiangsu, a province that has benefited from the growth of the past decade. Although Gansu is a poor province, urban incomes are determined largely by formal sector wages, which vary little across provinces. Thus, as table 10 shows, in 1982 mean income in urban Gansu was higher than in Jiangsu, and Gansu had a greater concentration of income under all criteria. By 1985–86, however, per capita income in urban Jiangsu was greater than in urban Gansu. Income in Gansu remained more concentrated at the upper and middle ranges, as depicted by the coefficient of variation, the Gini, and the Atkinson index with $e = 1$. In urban Jiangsu, however, the poor appear to have lagged behind the mean: there has been a sharp increase in the Atkinson indexes.

Table 10. *Income Inequality in Jiangsu and Gansu Provinces, 1982 and 1985–86*

Sector and indicator	1982 Jiangsu	1982 Gansu	1985–86 Jiangsu	1985–86 Gansu
Urban				
Mean annual income per capita (yuan)	593	648	962	874
Coefficient of variation	0.320	0.582	0.363	0.435
Gini coefficient	0.157	0.252	0.189	0.236
Atkinson index[a]				
$e=1$	0.044	0.109	0.075	0.096
$e=2$	0.083	0.182	0.253	0.214
$e=5$	0.183	0.323	0.876	0.638
Rural				
Mean annual income per capita (yuan)	309	174	555	277
Coefficient of variation	0.287	0.423	0.497	0.463
Gini coefficient	0.149	0.203	0.242	0.246
Atkinson index[a]				
$e=1$	0.038	0.068	0.102	0.104
$e=2$	0.075	0.122	0.286	0.233
$e=5$	0.175	0.231	0.940	0.731

a. e is the inequality aversion parameter.

Source: 1982 distributions, Lim and others (1985), p. 89; 1985–86 figures, authors' calculations based on the 1985–86 unpublished household survey.

Groups at Risk: Characteristics of the Poor

The characteristics of a typical poor household are illustrated by an example in Jiangsu. This was a household of three unemployed adults, headed by a disabled worker, aged 64. They subsisted on a disability pension equivalent to Y984 a year paid by the head's prior employer, a SOE. Thus China's elaborate labor insurance system does not guarantee above-poverty income, as this example shows.

There are two further groups of individuals that are likely to be among the poor. First, it has been estimated that there are as many as 51.6 million disabled in China. Government policy has been directed largely toward occupational rehabilitation, and 34,000 enterprises have been set up to employ disabled people, generating work for 1.34 million disabled workers and an output of Y18 billion in 1988 (communication from the Ministry of Civil Affairs, Beijing, March 1989). Although labor insurance is used for workers in the urban formal sector, in other sectors there is an emphasis on income generation and capability enhancement through occupational welfare schemes. This set of policies is known in China as "enhancing the ability to produce blood, rather than blood transfusion."

A second group of individuals in poverty are the 100 million people each year that are victims of natural disasters. Disaster relief in excess of Y1 billion is provided by the central government annually, mainly in the form of grain to augment local resources. In addition to the rescue, shelter, medical care, and feeding operations that are necessary, the government also establishes

employment-generating activities and attempts to restore infrastructure within three to six months. Early warning and information systems are crucial in mitigating the effects of natural calamities, and such systems have been improved considerably since the period of the great famine (1959–61) (Ahmad and Zou 1989).

There is a system of support for vulnerable rural individuals (widows, orphans, and the elderly without family support) known as the "five guarantee-system" or *wu bao* (see Ahmad and Hussain 1991). In 1988 there were 3 million claimants, who received Y1.5 billion, of which the central government provided Y200 million–Y300 million. Although the level of support varies, the average *wu bao* expenditure was thus Y500 per person in 1988, which suggests that the poverty lines taken in this article may have been somewhat on the low side. As with Victorian poor relief, the emphasis is more on preventing the "nondeserving" elderly from getting relief than on ensuring that all the "deserving" actually do derive benefits. There is a severe social stigma attached to the receipt of *wu bao* funds, and this restricts claim rates and the applicability of the measure. The preferred avenue for ensuring old age support is to rely on sons and if possible to reside with a son (see Jia 1988). As the very low number of claimants shows, the *wu bao* system has failed to provide an acceptable alternative to family support and thus to help curb the growth of the rural population.

IV. Concluding Remarks

The Chinese population in 1978 had low cash income, which was relatively equally distributed at the local level. Despite regional variations, destitution was rare, and social safety nets appeared to work, although the institutional arrangements restricted initiative. After the economic reforms, cash income grew rapidly, particularly in the major cities and coastal areas. Higher mean income, however, was associated with greater variance in standards of living both across and within regions. This appears to have put great stress on the social security system, broadly defined.

In some respects the rural areas of Gansu, Henan, and Shanxi are reminiscent of pre-1978 China, with low incomes and relatively low inequality. Sichuan, another low-income province (but with mean income greater than the above-mentioned provinces), has greater inequality and higher poverty levels than, say, Shanxi. However, the prospects of rapid agricultural growth in these areas must be somewhat limited. Without migration or alternative employment-generating possibilities, the government's policy of targeting extremely low-income counties for transfers, investments, and training would appear to be relatively pragmatic given the information costs of household-specific programs in a country of China's size and stage of development. In 1989 the central government supported 9 counties in Gansu, 34 in Shanxi, 16 in Sichuan, and 15 in Henan. Provincial governments supported 12 in Gansu, 21 in Shanxi, 30 in Sichuan,

and 9 in Henan. In addition, 20 counties in Gansu were supported by a special *Sanxi* (three western areas) grant.

The system of disaster relief in China is relatively well developed, and its information-gathering capabilities have improved since the famine of 1959–61. But the absence of a safety mechanism for vulnerable people in rural areas, other than *wu bao* for the elderly or incapacitated, is an issue of concern, and the poor and vulnerable in richer areas such as Jiangsu are similarly unprotected. There is clearly scope for examining public policies in such cases.

Shifting employment patterns, particularly with respect to township and village enterprises in rural areas and the floating (unregistered) population in urban areas, create both a set of opportunities and problems. The erosion of traditional household-based support, declining protection from unemployment, sharp increases in inflation, and the rise in variation in living standards in the post-reform period have raised new issues in China's social security system.

The economic reforms, which led to substantial increases in income after 1978, undoubtedly improved material living standards, especially in the early years. Subsequently, an unravelling of the established safety nets, an aging population, and the advent of high episodes of inflation reversed this trend for an increasing proportion of the population. In recent years increased poverty has coincided with falls in some of the related social indicators. Changing demographic patterns and employment prospects together make it essential to identify the vulnerable if the poor are to be protected. Although the Chinese method of identifying vulnerable areas is a useful first step in a poverty reduction strategy, it is not adequate to offset the problems and contingencies that China is likely to face in the coming decades.

Table A-1. *Percentage of Peasant Households in China by Nominal Net Income, 1978–88*

Yuan per capita	*1978*	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*
0–100	33.3	19.3	9.8	4.7	2.7	1.4	0.8	1.0	1.1	0.9	0.5
100–150	31.7	24.2	24.7	14.9	8.1	6.2	3.8	3.4	3.2	2.4	1.5
150–200	17.6	29.0	27.2	23.0	16.0	13.1	9.4	7.9	7.0	5.0	3.3
200–300	15.0	20.4	25.3	34.8	37.0	32.9	29.2	25.6	21.8	17.5	13.5
300–400		5.0	8.6	14.4	20.8	22.9	24.5	24.0	21.7	21.3	17.5
400–500	2.4[a]	1.5	2.9	5.0	8.7	11.6	14.1	15.8	16.5	17.2	16.7
Over 500		0.6	1.6	3.2	6.7	11.9	18.2	22.3	28.7	35.7	47.0
Average annual net income	134	160	191	223	270	310	355	398	424	463	545
Gini coefficient	0.32	0.28	0.26	0.23	0.22	0.25	0.27	0.30	0.31		

a. For over 300.

Source: State Statistical Bureau (annual-1988), p. 732, (annual-1989), p. 742, and (1989a), p. 465. Gini coefficients are calculated by World Bank staff.

Table A-2. *Peasants' Income Distribution and Household Size in China, 1985, 1987, and 1988*

	1985			*1987*			*1988*		
Yuan per capita	*Percentage of house-holds*	*Number of household members*	*Percentage of popula-tion*	*Percentage of house-holds*	*Number of household members*	*Percentage of popula-tion*	*Percentage of house-holds*	*Number of household members*	*Percentage of popula-tion*
Below 100	1.0	6.09	1.13	0.87	6.09	0.98	0.5	6.09	0.6
100–150	3.4	6.09	3.83	2.38	6.09	2.68	1.5	6.09	1.7
150–200	7.9	5.90	8.63	4.99	5.90	5.45	3.3	5.90	3.6
200–300	25.6	5.82	27.5	17.51	5.82	18.8	13.5	5.82	14.6
300–400	24.0	5.53	24.5	21.34	5.53	22.0	17.5	5.53	18.0
400–500	15.8	5.08	14.8	17.21	5.10	16.3	16.7	5.20	16.1
Over 500	22.3	4.91	20.2	35.7	5.10	33.7	47.0	5.20	45.3

Source: Authors' calculations based on State Statistical Bureau (1985b), p. 20. The columns on household size are based on data from Hubei province.

Table A-3. *Proportion of Urban Households in China by Nominal Monthly Income Per Capita, 1981–88*

Yuan per month per capita	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*
0–20	2.05	0.92	0.61					
20–25	5.46	3.68	2.97	1.67	11.05			
25–35	31.81	25.63	20.32	10.52		5.67	4.24	8.32
35–50	42.29	45.40	46.56	38.89	24.78	14.81	11.70	
50–60	11.90	14.20	16.42	22.67	19.53	16.17	13.36	7.61
60–70					16.04	17.86	15.74	10.26
70–80					10.96	14.82	14.61	12.53
80–90					7.01	10.24	12.09	12.46
90–100					4.11	7.40	8.49	11.91
100–110	6.49	10.17	13.12	26.25	2.63	4.60	6.08	9.21
110–120						3.05	4.35	7.25
120–130						1.83	3.03	5.32
130–140					3.89	1.24	2.04	3.82
140–150						0.39	1.11	2.95
Over 150						1.69	3.17	8.36
Average	38.17	41.21	43.83	50.63	57.11	68.99	76.33	93.25

Note: Figures after brackets are the sums for the income groups bracketed.

Source: State Statistical Bureau (annual-1988), p. 716, (annual-1989), p. 726, and 1989a, p. 462.

Table A-4. *Total and Urban Population: Comparison between the State Statistical Bureau and United Nations Estimates, 1985–90*

		Urban population as percentage of total population	
Year	*Total (millions)*	*State Statistical Bureau*	*United Nations*
1985	1,050.4	36.4	20.6
1986	1,065.3	40.8	20.8
1987	1,080.7	46.1	20.9
1988	1,096.1	49.3	21.1
1989			21.2
1990			21.4

Source: State Statistical Bureau (1989a), pp. 350 and 352; and United Nations (1986), table A-1.

Table A-5. *Urban Income Distribution and Household Size in China, 1985, 1987, and 1988*

Yuan per year per capita	1985 *Percentage of households*	1985 *Number of household members*	1985 *Percentage of population*	1987 *Percentage of households*	1987 *Number of household members*	1987 *Percentage of population*	1988 *Percentage of households*	1988 *Number of household members*[a]	1988 *Percentage of population*
0–240									
240–300	11.05 (0–420)								
300–420		5.03	14.6	4.24	4.43	5.02	8.32		
420–600	24.78	4.08	26.47	11.7	4.39	13.73		4.39	9.77
600–720	19.53	3.75	19.17	13.36	4.18	14.93	7.61	4.18	8.51
720+	44.64	3.41	39.85	70.7	3.70	66.33	84.1	3.70	81.7
Total	100	3.82	100	100	3.74	100	100	3.74	100

a. 1987 figures used because of lack of data for 1988.

Source: Author's calculations based on data from State Statistical Bureau (annual-1986, 1988, 1989) and (1989a).

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Structural Adjustment and the Welfare of Rural Smallholders: A Comparative Analysis from Sub-Saharan Africa

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The direction and level of changes in real incomes brought about by structural adjustment are determined by a variety of factors, including sources of income, patterns of expenditures, and movements in relative prices in the wake of adjustment. An econometric model is used to derive an index of real income, which is employed for data from Côte d'Ivoire, Ghana, Malawi, Madagascar, and Tanzania. No systematic changes in relative prices, and especially in the ratio of tradable to nontradable prices, were noted after the beginning of adjustment, although the diversity of income sources implies that the implications of movements in relative prices on smallholder welfare are indeed complex. The results indicate that there is no unequivocal pattern of increase or decline in the real welfare of the rural poor but that there are marked differences among countries and regions.

Stabilization and structural adjustment programs are being implemented widely in Sub-Saharan Africa in response to the macroeconomic crisis that emerged during the 1970s. Although the timing and nature of adjustment has differed markedly from one country to the next, one of the common aspects is that the economic opportunities faced by various agents in the economy will be changed. In particular, of key importance are the expenditure switching policies of the adjustment programs, which alter relative prices for various products and factors, generally with the intent of expanding the tradable goods sector. Policies that bring about changes in the price signals in the economy will affect household welfare as mediated by changes in the structure and level of incomes and consumption. This article is concerned with how macroeconomic adjustment policies affect low-income rural smallholder households, since they comprise a

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large percentage of households in most Sub-Saharan African countries, many of which are appropriately classified as poor.

Since it has been shown that the rural poor are often net consumers of staple grains, especially traded goods whose prices are assumed to increase commensurate with devaluation or removal of price controls, adjustment programs are asserted to have deleterious consequences for the rural poor. The expectation that adjustment programs will induce a fall in real wages further exacerbates the negative impact of adjustment (see Pinstrup-Andersen 1988; Cornia, Jolly, and Stewart 1987). A contrary argument is that adjustment programs stand to help the rural poor directly or indirectly by raising producer incentives and rural incomes. Relative price movements commensurate with adjustment are seen to favor products produced by smallholders, whose real incomes will consequently rise . A more balanced and agnostic viewpoint is that the impact of adjustment on the poor is not knowable a priori and will be determined by the propensities of the poor to produce and consume tradables versus nontradables, as well as by actual movements in relative prices (see Addison and Demery 1985 and Sahn 1990).

In order to address this debate and gain some further insight into how smallholders are affected by adjustment in the short term, two especially important issues require careful analysis. The first is the structure of poor rural smallholders' income and consumption, namely, the sources from which they derive income, appropriately grouped for analysis, and the products that satisfy their consumer needs. The second aspect is how structural adjustment affects the values of these magnitudes by means of changes in relative prices.

In this article the emphasis will be on examining the relevant economic signals before and after policy reforms were instituted. This procedure cannot attribute any changes in the relevant signals to specific adjustment programs. To analyze how policy reforms affect economic signals in an economy is a major undertaking, which would necessitate the use of complex empirical models (see Scobie 1989, Pinstrup-Andersen 1990, and Sarris 1990). However, our aim is to infer directions of welfare changes after reforms were instituted and not to examine whether the change in the fortunes of the poor is due only to adjustment or to other concurrent developments. We are interested in the welfare changes of a typical household within a given group, rather than how the total magnitude of poverty will change (Kanbur 1987).

The next section outlines the methodological framework and analytical model that is to be used to examine how low-income smallholder households are affected by macroeconomic adjustment. This is followed by a discussion of the data employed from the five countries included in the comparative analysis: Côte d'Ivoire, Ghana, Malawi, Madagascar, and Tanzania. This presentation and discussion of descriptive statistics will focus on characterizing the structure of consumption and sources of income and on price movements that have occurred during adjustment. We then present the results of the analytical model as well as policy implications of the findings.

I. Methodology

The precise definition of poverty or vulnerability is a matter of considerable research, and we shall not delve into the issue here. We begin with a rural smallholder household that is representative of a class that has been identified as poor or vulnerable. The household will derive its income from agricultural and nonagricultural activities. The agricultural activities will be distinguished among those that produce exportable and other nonfood tradable cash crops (such as coffee, cocoa, cotton, and tea), those that produce tradable staple food crops (mainly maize, rice, and wheat), and those that produce nontradable food products (such as coarse grains, roots and tubers, fruits and vegetables, and livestock products).

The share of income derived from own-account agricultural activities and other agricultural or nonagricultural activities are denoted by S_a and S_r, respectively, in some base year, and include transfers and remittances, where

$$S_a + S_r = 1. \tag{1}$$

The shares of own-operated farm agricultural income derived from activities that produce exportable, tradable staple food, and other nontradable agricultural products are denoted by S_{ae}, S_{af}, and S_{ao}, respectively. The base year shares of total household consumption expenditures (including subsistence consumption) are denoted by θ_f, θ_o, and θ_n for expenditures on tradable staple food products, nontradable food products, and nonagricultural products, respectively. Changes in the welfare of this type of household can then be monitored by examining the following index of changes in real income:

$$\tilde{Y} = [(S_{ae}\tilde{P}_e^p + S_{af}\tilde{P}_f^p + S_{ao}\tilde{P}_o^p) + S_r\tilde{r}] - (\theta_f\tilde{P}_f^c + \theta_o\tilde{P}_o^c + \theta_n\tilde{P}_n^c) \tag{2}$$

where Y is real income; P_e, P_f, and P_o are the price indexes of the three agricultural product groups outlined above, with the superscript p for producer prices and c for consumer prices; r is the unit reward of any nonagricultural production activities of the given class of households; and P_n^c is the consumer price of the nonagricultural product. The symbol ~ above a variable indicates a percentage change over a given period.

Equation 2 can be derived by taking the derivative of a standard household consumer utility function, which is a function only of quantities consumed, under the assumption that the household earns income by operating on a standard production possibility frontier of agricultural and other activities. As long as smallholder activities are labor intensive and total labor available for each household and technology do not change, the frontier will not shift outward over time. Thus only substitution among activities because of relative price changes will occur. This implies that quantity changes should not be part of equation 2. In Côte d'Ivoire, Ghana, Malawi, Madagascar, and Tanzania, per capita production of total agricultural output has not been increasing. If the technology is labor-using and there is full employment, not much aggregate supply response to price is expected (Binswanger 1989).

Although changes in the prices of the three agricultural products faced by producers and consumers and in the price of the nonagricultural product P^c_n, can be observed and monitored relatively easily, the price of nonagricultural production activity r cannot. Given, however, that in many countries a large share of the income of poor households is derived from such activities, it cannot be neglected. This has been acknowledged by several authors, who have emphasized the relation between the agricultural and nonagricultural wage and the price of other agricultural products (Ravallion 1989, Sah and Stiglitz 1987). In our approach, however, r symbolizes something wider than just wages. It stands for the reward to any other type of activity, apart from work on one's own farm. The appendix presents the outline of a model through which the change in r can be expressed as a function of the changes in the other four observable prices in equation 2, as well as several other parameters related to adjustment and smallholder income.

The derivation of the model described in the appendix yields the following expansion of equation 2 that captures changes in real income:

$$\hat{Y} = \left\{ \left(S_{ae} + \frac{S_r \lambda_a b_e}{(1-\gamma)\Delta} \right) \hat{P}^p_e + \left(S_{af} + \frac{S_r \lambda_a b_f}{(1-\gamma)\Delta} \right) \hat{P}^p_f \right.$$

$$(3) \qquad + \left(S_{ao} + \frac{S_r \lambda_a b_o}{(1-\gamma)\Delta} \right) \hat{P}^p_o + \frac{S_r \lambda_n}{(1-\alpha-\beta)\Delta} \hat{P}^p_n$$

$$\left. - \frac{S_r \lambda_n \beta \hat{P}_m}{(1-\alpha-\beta)\Delta} \right\} - \{\theta_f \hat{P}^c_f + \theta_o \hat{P}^c_o + \theta_n \hat{P}^c_n\}$$

where:

$$(4) \qquad \Delta = \frac{\lambda_n(1-\beta)}{1-\alpha-\beta} + \frac{\lambda_a}{1-\gamma}.$$

The symbols in equations 3 and 4 are explained in detail in the appendix. They involve the labor parameters of the Cobb-Douglas production function (α, β, γ), aggregated labor shares in agriculture and nonagriculture (λ_a, λ_n), and shares of exportables, traded food, and other agricultural activities in total agricultural output (b_e, b_f, b_o). The price P_m denotes an index of noncompetitive imported goods. Equation 3, therefore, depends on structural variables and changes in price indexes that are relatively easy to estimate, as well as on a set of assumptions that are explored explicitly in the appendix.

The weights multiplying producer prices inside the first bracket in the right-hand side of equation 3 sum to one. Similarly, the weights in the second bracket sum to one. In other words, real income changes can be looked at as changes in the ratio of a Laspeyres index of nominal income (in combination with wages) and a Laspeyres index of consumer prices, with weights specific to the poor smallholders being examined in this study.[8]

The use of a fixed weight index underestimates real income gains and over-

estimates real income losses. This is so because the output, and consequently the income shares in the numerator, would tend to increase for products whose prices increase, and hence a fixed weight numerator would tend to be smaller than a true index. In the denominator, substitution among consumed goods would tend to lessen consumption shares for products whose prices increase. Hence, the fixed weight denominator would tend to be larger than the true one.

We could make the analysis more accurate by starting with a base year t_0 and using equation 3 to estimate the first order welfare changes for a subsequent period t_1, given observed price changes. Assumptions about production transformation parameters and own price and cross-price elasticities of demand could then be used to estimate new production and consumption shares in period t_1, which could be used to estimate welfare changes for period t_2 and so on. Although such an analysis of piecewise linearization and updating will give a better estimate of welfare changes, it must be based on assumptions about the values of several parameters, which are normally not available for countries in Sub-Saharan Africa. Hence, the second order gain in prediction accuracy might be lost by the parameter uncertainty. It is also the case that a variable weight divisia index in both the numerator and the denominator would clearly be superior, but there are no data with which to implement it. Therefore we have adopted a simpler and more straightforward analysis, but recognize the direction of bias being introduced into the analysis.

II. Data and Descriptive Statistics

To apply the framework described above, a data set on the sources from which households derive income and the products that satisfy their consumer needs has been organized for Côte d'Ivoire, Ghana, Malawi, Madagascar, and Tanzania. Household data on income and consumption from each country were analyzed. For Côte d'Ivoire, the Côte d'Ivoire Living Standards Survey data from 1985–86 were analyzed as the basis for understanding the income sources and the expenditure patterns. (See Grootaert 1986 and Ainsworth and Munoz 1986 for a description of the unpublished data set.) The Ghana Living Standards Survey from 1987–88 was analyzed to describe income and consumption patterns in Ghana. (The unpublished survey, conducted by the Ghana Statistical Service in cooperation with the World Bank, follows the structure of the Côte d'Ivoire survey.) For Côte d'Ivoire and Ghana, two prototype households are distinguished—one for the forest region and the other for the savannah—to reflect the main agroclimatic zones for smallholder agriculture. In both surveys, the profile of consumption and production characteristics was based on our analysis of the data tapes, which allowed us to select the bottom 20 percent of the per capita expenditure distribution.

The data for Madagascar were derived primarily from the social accounting matrix for 1984 (Dorosh and others 1990), which used various national accounts and regional surveys to define a group of smallholder farms cultivating

Table 1. *Sources of Total Income of Low-Income Rural Smallholders in Five Countries in Sub-Saharan Africa, Selected Years*
(percentage of total income)

	Per capita total income								
	Côte d'Ivoire		*Ghana*		*Madagascar*			*Malawi,*	*Tanzania,*
Type of income	*Forest*	*Savannah*	*Forest*	*Savannah*	*Coast*	*Plateau*	*South*	*south*	*all*
Agricultural income	76	81	57	68	42	39	48	51	73
From home consumption	31	40	37	54	25	31	37	37	50
From agricultural sales	45	41	20	14	17	8	11	14	23
Nonagricultural earned income[a]	21	17	40	31	55	58	49	13	25
Nonearned income[b]	3	2	3	1	3	3	3	36	2

a. Includes wages, salaries, and own-account earnings.

b. Includes income from transfers, remittances, and other nonearned sources.

Source: Based on data from: Côte d'Ivoire, 1985–86 Côte d'Ivoire Living Standards Survey (unpublished); Ghana, 1987–88 Ghana Living Standards Survey (unpublished); Madagascar, Dorosh and others (1990); Malawi, Harvard Institute for International Development (1989); and Tanzania, 1976–77 government household survey (unpublished).

between 0.25 and 1.5 hectares. The data allow us to distinguish between households in three agroclimatic regions (coast, plateau, and south) with markedly different production characteristics.

For Malawi, data tapes from a regional survey conducted in the Zomba district in the southern region were analyzed to arrive at the income and consumption patterns. (See Peters and Herrera 1989 for a complete discussion of the survey.) Because the communities surveyed were all in the densely populated region, the data have limited applicability to the more land-abundant regions in the north and center of the country. In keeping with the intent to profile the poor smallholder, the mean landholding of the smallholders represented in this sample was only 1.5 hectares. However, these households are not likely the poorest of the poor, given that the high population density in the region has contributed to a large number of households having less than 0.5 hectare to cultivate (Sahn and Arulpragasam, forthcoming).

The data for Tanzania were derived from the results of a nationwide household survey performed in 1976–77. The unpublished survey covered 2,744 households across a larger spectrum of landholding sizes and incomes than the surveys in the other four countries; nonetheless, it included predominantly poor smallholders who have an average holding size of 1.43 hectares.

Sources of Income

Initially we distinguish among three income categories: earnings from agricultural activities, earnings from nonagricultural activities, and nonearned income (table 1). Agricultural income includes the income derived from the sale of what is produced as well as the imputed value of the portion of the household's production that is consumed by the household. Nonagricultural income includes income from wages, salaries, and own-account other than farming. Nonearned income includes income in the form of remittances, the imputed value of rent (where it could be estimated), and other transfers. Despite the great diversity in income shares, a few interesting features of these data are worth highlighting. First, even for smallholder households, nonagricultural earned income is a significant share of the total. For example, nonagricultural income in Côte d'Ivoire was 21 and 17 percent of total income for the forest and savannah regions, respectively. Figures for the two regions in Ghana were 40 and 31 percent, respectively. In Malawi nonagricultural income represented 13 percent of total income, while the figure for Tanzania was 25 percent. Among the data examined, the highest income share from nonagricultural activities, including wages, salaries, and own-account, was observed in the plateau region of Madagascar, where it was 58 percent of total income.

Second, even though nonearned income is the least important category, it makes a significant contribution in Malawi, where it comprises 36 percent of total per capita income. This is attributable to the fact that remittances from men working in South Africa or on estates within Malawi is an extremely

Table 2. *Sources of Agricultural Income of Low-Income Rural Smallholders in Five Countries in Sub-Saharan Africa, Selected Years*
(percentage of total agricultural income)

	Per capita agricultural income								
	Côte d'Ivoire		Ghana		Madagascar			Malawi, south	Tanzania, all
Source of agricultural income	*Forest*	*Savannah*	*Forest*	*Savannah*	*Coast*	*Plateau*	*South*		
Traded food[a]	14	32	18	26	23	30	36	53	35
Consumed by the household	8	18	9	16	23	28	33	52	27
Sold	6	14	9	10	[d]	2	3	1	9
Nontraded food[b]	41	46	70	73	46	69	58	24	61
Consumed by the household	32	31	57	63	35	51	44	20	42
Sold	9	14	13	10	11	18	15	4	18
Export crops[c]	45	22	12	1	31	1	6	23	4

a. Rice, maize, groundnuts, and other traded food.
b. Millet, cassava, sweet potato, yams, and other nontraded food.
c. Cocoa, tobacco, cotton, coffee, cola nuts, rubber, sugar, and other exportables.
d. A positive share less than 0.50 percent.

Source: Based on data from: Côte d'Ivoire, 1985–86 Côte d'Ivoire Living Standards Survey (unpublished); Ghana, 1987–88 Ghana Living Standards Survey (unpublished); Madagascar, Dorosh and others (1990); Malawi, Harvard Institute for International Development (1989); and Tanzania, 1976–77 government household survey (unpublished).

important source of income for smallholder households in the highly land-constrained southern region of the country.

Third, we are able to distinguish between the relative value shares of goods that are consumed by the household and those that are marketed. In all cases, except in Côte d'Ivoire, the value of household consumption dominates sales. This indicates a relatively noncommercialized agricultural sector.

Of greatest relevance, however, is the difference between tradable (such as rice, maize, and groundnuts) and nontradable (such as roots and tubers, vegetables, meat, and milk) food products and export crops (such as coffee, tea, tobacco, cocoa, and cloves) in the production of the average smallholder household for each country or region (table 2). As indicated earlier, we focus on the implications of price changes among these three components of agricultural earnings and on nonagricultural earnings *r*. By definition, virtually none of the export crops are consumed by the household. Although designating a commodity as a nontradable implies that it is not a direct substitute for an import good and is likewise not traded internationally, there is still considerable scope for selling such commodities in the local market place. Therefore, like tradable goods, these appear in both consumption and marketing of the households.

The relative importance of these classes of goods in overall agricultural incomes (including the imputed value of household consumption) and in revenue from sales varies considerably from one country or region to the next (table 2). In Côte d'Ivoire, tradable food products comprise only 14 percent of total agricultural income (including the imputed value of household consumption) in the forest region, whereas the comparable figure is 33 percent for the savannah. Export crops represent 45 and 22 percent of agricultural incomes and 75 and 43 percent of agricultural sales revenue, in the two regions, respectively. These patterns reflect the dominance of coffee and cocoa in the forest region. In the savannah only cotton is an important export crop, and tradable and nontradable food crops (such as maize, rice, and yams) represent nearly equally important sources of income. In other countries export crops as a share of total agricultural incomes and as a share of sales revenue are also much lower than those observed in the Côte d'Ivoire forest region. In Tanzania, the savannah region of Ghana, and the plateau region of Madagascar, only 4, 1, and 1 percent, respectively, of agricultural incomes are from production of export crops. In Malawi 23 percent of agricultural incomes (and 83 percent of sales revenue) is from the primary export crop, tobacco, and 12 percent of agricultural income (35 percent of the sales revenue) in the forest region of Ghana is from export crops (cocoa and cola nut).

Perhaps the most interesting finding concerning the three groups of agricultural goods is that nontradable goods represent a very high share of total agricultural income as well as a high share of sales revenue. In Ghana, 70 percent of agricultural income is from nontradables in the forest region, with the comparable figure being 73 percent in the savannah. Nearly 40 and 50 percent of the sales revenue are from these sources in the two regions, respectively. In the

Table 3. *Expenditures by Low-Income Rural Smallholders in Five Countries in Sub-Saharan Africa, Selected Years*
(percentage of total expenditures)

	Per capita expenditure								
	Côte d'Ivoire		*Ghana*		*Madagascar*			*Malawi, south*	*Tanzania, all*
Type of expenditure	*Forest*	*Savannah*	*Forest*	*Savannah*	*Coast*	*Plateau*	*South*		
Food	65	70	73	80	59	65	62	61	71
Traded	15	28	10	26	19	16	16	35	23
Rice	6	11	2	8	13	16	13	0	5
Maize	5	10	6	16	a	a	a	33	17
Groundnuts	1	5	1	1	a	a	a	2	1
Other	2	3	1	1	5	0	3	0	0
Nontraded	50	42	63	54	46[b]	49[b]	49[b]	26	48
Millet	0	3	0	16	a	a	a	1	4
Cassava	4	3	12	5	—	—	—	1	2
Other	46	37	51	33	—	—	—	25	41
Nonfood	35	30	27	20	41	35	38	39	29

— Not available.

a. A positive share less than 0.50 percent.

b. The data for Madagascar did not permit the role of cassava to be distinguished from that of other goods in the nontraded goods share.

Source: Based on data from: Côte d'Ivoire, 1985–86 Côte d'Ivoire Living Standards Survey (unpublished); Ghana, 1987–88 Ghana Living Standards Survey (unpublished); Madagascar, Dorosh and others (1990); Malawi, Harvard Institute for International Development (1989); and Tanzania, 1976–77 government household survey (unpublished).

Tanzania sample, nontradables were observed to comprise as high as 61 percent of total agricultural incomes and nearly 60 percent of the sales revenue. Even in the more commercialized Côte d'Ivoire, nontradables contribute 46 and 41 percent to total agricultural incomes in the savannah and forest regions, respectively. The relatively low level of nontradables in agricultural incomes in Malawi—24 percent—reflects the domination of maize in the diet.

The value of tradable food crops consumed by the households is generally greater than the value of sales of the same goods. This can be seen, for example, with maize and rice in both regions of Côte d'Ivoire and in Tanzania and Malawi. However, the degree to which household consumption dominates the sales of these specific commodities differs dramatically from one case to the next. In Malawi, where commercialized agriculture is by and large limited to the leasehold estate sector, the value of home-consumed maize per household is 100 times the value of sales. In the more commercialized forest region of Côte d'Ivoire 30 percent of the maize and nearly half of the rice is sold. Similarly, around half of the maize in Ghana's forest region is sold.

A sizable proportion of nontradable goods is sold, albeit locally. For example, 30 percent of the total value of nontradable crops in Tanzania is marketed. This is very close to the 32 percent observed for low-income smallholders in the savannah region of Côte d'Ivoire, which in turn is considerably higher than that in the forest region. However, in Malawi only 15 percent of nontradable goods are sold, which is in keeping with the overall lower level of commercialization of agriculture in the region. A larger share of nontradable goods than tradable commodities is sold locally in Malawi. Thus, local trade in nontradables represents an important source of agricultural and nonfarm income for traders, as well as for low-income smallholders.

Expenditure Shares

As expected of poor smallholder households, the share of expenditures allocated to food is high. The actual numbers range between 59 percent on the coast of Madagascar to 71 percent in Tanzania, 71 percent in the savannah in Côte d'Ivoire, and 80 percent in the savannah in Ghana (table 3).

A more disaggregated look at expenditures indicates that the shares represented by tradable versus nontradable commodities are quite variable. In the savannah region of Côte d'Ivoire, and especially in the southern region of Malawi, a relatively small portion of total expenditures (42 and 26 percent, respectively) is in the form of nontradable goods. However, for Ghana, 63 percent out of the 73 percent of the budget allocated to food in the forest region is in the form of nontradable goods. This reflects the importance of roots and tubers, legumes, vegetables, and meat (including fish and poultry) in the consumption bundle of the population. For example, yams alone in the Ghana forest region account for as high a budget share as rice and maize combined in the forest region of Côte d'Ivoire. In contrast, expenditures on tradables are higher in Malawi owing to the importance of maize in the consumption bundle.

Prices

For each country and region six price indexes were constructed. Three producer price indexes approximate developments in the prices of exportables, tradable food crops and other nontradable food products, respectively. Three consumer price indexes similarly summarize developments in the consumer prices of tradable food products, nontradable food products, and nonfooc products.

The indexes were constructed from time series data for the producer anc consumer prices of a number of products, which were considered major o representative. The shares in income and consumption of the pertinent grou were considered in aggregating the different price series into group specifi indexes. For example, for Côte d'Ivoire, the export price index was constructe by considering the producer prices of cocoa and coffee, with different weight for the forest and savannah rural poor, which reflect their respective incom shares from table 2, scaled up so as to sum to one. Similarly, maize and ric producer prices were considered representative for the tradable food price index while producer prices for plantain, cassava, and yams were considered represen tative of the other agricultural products category. For the consumer price in dexes in Côte d'Ivoire, consumer prices for maize and milled rice were consid ered representative of the tradable food price index; plantain, cassava, and yam were considered representative for the products consumed under the othe nontradable foods category, and the nonfood consumer price index was taken t represent the consumer prices of nonfood products. Similar procedures wer followed for the other countries and groups.

In equation 3 there is one other price that must be specified: the price c importable intermediate products P_m. As a proxy for this we used the nomin exchange rate, multiplied by the import unit value index for African countri (which is from IMF 1990b).

Table 4 exhibits the evolution of the ratios of producer price indexes exportable agricultural products (P_e^p) to the price indexes of tradable foods (P and nontradable agricultural products (P_o^p) for each country and region. Give that exchange rate depreciation is a pillar of policy reform efforts in Sul Saharan Africa, one would generally expect the price of exportables to ri compared with the price of nontradable agricultural products. At the same tin one would not expect the expenditure-switching policy to cause a significa trend in the price of exportables with respect to tradable food crops. Despi these expectations, some caveats apply that may result in outcomes differing i practice. First, parallel free markets may be operating so that prices observ before adjustment already reflected what could be viewed as an approximatic of the equilibrium exchange rate toward which adjustment will move the offici market. Second, exchange rate devaluation is often undertaken in combinatic with other domestic and international trade and marketing reforms, such adjustment of quotas and tariffs that may offset some of the gains to farmers

losses to consumers that would be a consequence of higher relative prices for tradables and export goods. Third, there is often a considerable lag between the beginning of adjustment programs and the implementation of real policy changes.

With these points in mind, it comes as no surprise that the results of the price ratios analysis are mixed. For Ghana it appears that the ratio of exportables to tradable foods is higher after 1984 in both regions, and likewise the ratio of exportables to nontradable agricultural products also appears to have reversed a decline before 1984. In Côte d'Ivoire the trends appear to be quite different. Although the ratio of P^p_e/P^p_f appears to have risen after adjustment, the ratio P^p_e/P^p_o exhibits a clear downward trend. This likely reflects in part the appreciation of the CFA franc during this period.

In Malawi and Tanzania no significant trend is apparent in either ratio. In Malawi this is explained by pricing policy for export crops, specifically the tobacco varieties that smallholders are permitted to produce. The government administers the price of tobacco, and parastatals assume all the responsibility for procuring and marketing the crop. Therefore, there is no opportunity for the potential benefits of expenditure switching policies to be transmitted to the farmer. In Madagascar the trend in P^p_e/P^p_o takes a big jump in 1987 and 1988, back to levels observed in the 1970s. After falling dramatically in 1982 and 1983, during the formative stages of Madagascar's adjustment program, P^p_e/P^p_f showed signs of increasing during 1984 to 1988. However, in 1986 rice prices soared owing to insufficient imports and the emergence of shortages.

A similar set of consumer prices and ratios, including tradables to nontradables, tradables to nonfood, and nontradables to nonfood, were constructed. As with producer prices, in consumer price ratios there is little indication of generalizable trends that correspond to what might be expected to occur during adjustment: expenditure-switching policies that favor exportables, or at least tradable goods, relative to nontradables. This is explained by the fact that movements in prices in each country must be related not only to the specific exchange rate regime, but also to the commercial policies being pursued, institutional reforms that allow prices to clear the market, and stochastic events such as rainfall.

But perhaps of equal note is the instability in the price ratios in some of the countries. In Madagascar, for example, the large decline in P^p_e/P^p_f in 1986 reflected the shortfall in imports when a lack of coordination between ministries caused the government distribution system to run out of stocks (Shuttleworth 1989). In Malawi, P^p_e/P^p_f decreased from 100.0 in 1981 to 64.5 in 1982 because of a dramatic increase in the price of tradable food crops. Maize prices increased from Mk6.6 to Mk11.0, and the price of groundnuts increased from Mk33.8 to Mk51.9, while tobacco, the predominant export crop, witnessed a very small price change. In 1983, however, the tobacco price increased from Mk45.1 to Mk75.9, while maize prices did not change; the P^p_e/P^p_f ratio increased to 107.5. Thus price policy in Malawi was affected by a variety of signals, such as the

Table 4. *Producer Price Ratios for Exportable, Tradable Food and Nontradable Agricultural Products in Five Countries in Sub-Saharan Africa, 1975–89*
(percent)

Year	Côte d'Ivoire		Ghana		Madagascar			Malawi, south	Tanzania, all
	Forest	Savannah	Forest	Savannah	Coast	Plateau	South		
	Ratio of exportable agricultural product prices to tradable food prices (P_c^e/P_t^f)								
1975	79.8	143.7	175.3	180.9	178.8	196.4	196.4	95.8	123.6
1976	76.3	135.6	98.0	105.2	195.5	212.4	212.4	87.6	146.3
1977	74.0	122.7	67.8	77.8	192.0	211.2	211.2	98.5	117.1
1978	86.3	103.5	140.2	157.9	199.0	214.5	214.5	128.8	107.8
1979	85.1	97.7	152.4	168.9	194.7	189.9	189.9	123.3	108.9
1980	112.6	110.7	74.6	84.4	167.4	164.4	164.4	100.0	120.0
1981	100.0	100.0	124.6	141.0	161.4	159.5	159.5	100.0	94.9
1982	98.0	91.4	115.3	118.3	100.0	100.0	100.0	64.5	93.9
1983	93.1	84.5	39.9	44.1	107.8	101.0	101.0	107.5	101.6
1984	126.5	78.5	100.0	100.0	126.9	125.9	125.9	95.0	78.6
1985	111.3	90.4	205.7	214.7	106.8	112.2	112.2	113.2	88.9
1986	127.5	125.4	196.5	205.9	71.6	82.8	82.8	107.1	100.0
1987	124.9	126.1	200.1	212.8	117.4	139.3	139.3	114.8	105.2
1988	106.0	106.9	179.0	191.5	172.7	199.5	199.5	97.9	116.8
1989	—	—	—	—	—	—	—	97.7	137.3

Table 4. *(continued)*

Year	Côte d'Ivoire Forest	Côte d'Ivoire Savannah	Ghana Forest	Ghana Savannah	Madagascar Coast	Madagascar Plateau	Madagascar South	Malawi, south	Tanzania, all
	Ratio of exportables to nontradable agricultural products (P_E^a/P_N^a)								
1975	191.9	275.1	—	355.3	145.3	178.0	163.9	65.1	112.9
1976	159.3	229.7	—	207.8	176.5	213.5	194.2	69.6	113.4
1977	86.3	136.5	122.1	107.3	136.5	176.3	153.0	78.3	65.2
1978	101.0	119.1	224.8	188.8	131.1	168.5	143.2	96.8	58.8
1979	85.6	101.9	227.2	225.6	118.3	143.4	117.4	95.6	70.7
1980	99.9	101.2	131.8	119.1	106.8	118.3	105.7	100.0	87.0
1981	100.0	100.0	153.9	153.7	93.0	99.6	92.9	100.2	98.0
1982	96.0	96.3	115.8	116.5	100.0	100.0	100.0	107.4	97.8
1983	80.6	80.4	45.1	50.4	103.7	95.7	96.4	85.8	100.7
1984	85.7	77.9	100.0	100.0	106.4	105.8	105.5	66.2	85.8
1985	97.0	97.5	279.2	277.7	102.5	108.7	107.1	75.0	88.9
1986	90.1	98.1	242.6	298.7	88.9	116.9	103.2	66.9	100.0
1987	87.8	94.5	182.6	265.8	129.7	173.9	152.6	71.7	107.0
1988	85.1	90.7	242.0	229.9	171.6	209.3	197.6	74.1	120.7
1989	—	—	—	—	—	—	—	82.2	128.2

— Not available.

Note: The indexes for each country and region equal 100.0 in the year in which the first World Bank structural adjustment loan was approved for that country.

Source: Computed from data from: Côte d'Ivoire, International Monetary Fund (1990a), Government of Côte d'Ivoire (various years), and World Bank data; Ghana, Alderman (forthcoming), Republic of Ghana (1989), and World Bank data; Madagascar, Republic of Madagascar (1988), Dorosh, Bernier, and Sarris (1990), and Dorosh and others (1990); Malawi, Government of Malawi (various years), Sahn and Arulpragasam (forthcoming), and World Bank data; Tanzania, Government of the United Republic of Tanzania (1988, 1989), Economic Research Bureau (various years), and World Bank data.

Table 5. *Values of Other Structural Parameters in Five Countries in Sub-Saharan Africa*

Parameter	*Côte d'Ivoire*	*Ghana*	*Madagascar*	*Malawi*	*Tanzania*
Share of labor in nonagricultural production (α)	0.58	0.48	0.56	0.49	0.65
Share of capital in nonagricultural production (β)	0.12	0.13	0.20	0.22	0.18
Share of labor in agricultural production (γ)	0.66	0.66	0.58	0.66	0.90
Share of labor employed in agriculture (λ_a)	0.64	0.53	0.74	0.81	0.61
Share of labor employed in nonagriculture (λ_n)	0.36	0.47	0.26	0.19	0.39
Share of export crops in total agricultural output (b_e)	0.44	0.15	0.07	0.28	0.16
Share of traded food crops in total agricultural output (b_f)	0.07	0.16	0.26	0.43	0.17
Share of other food products in total agricultural output (b_o)	0.49	0.69	0.67	0.29	0.67

Source: Computed from data from: Côte d'Ivoire, World Bank data; Ghana, World Bank (1983, 1990) and national accounts and production data from the government of Ghana; Madagascar, Dorosh and others (1990); Malawi, Government of Malawi (1985), Government of Malawi (various years b), Government of Malawi (various years c), World Bank data, and trade data from the National Statistics Office of Malawi; and Tanzania, World Bank (1990) and 1976 input-output table, and national accounts data from the government of Tanzania.

maize shortage in 1981 and pressure to increase foreign exchange commensurate with the signing of the second adjustment loan in 1983 (Sahn and Arulpragasam forthcoming).

Another example of a marked incongruity in the price ratio is found in Ghana in 1983, when both P^p_s/P^p_f and P^p_e/P^p_o plummeted. The explanation is to be found in the food shortages caused by the drought and bush fires that decimated food crops, driving the prices of rice, maize, and subsequently roots and tubers to dramatic highs (Alderman forthcoming).

Many interesting stories could be told about observed price fluctuations. The data indicate the lack of clear adjustment-induced trends in prices. Smallholders have been, and continue to be, buffeted by price shocks. The combination of the stochastic nature of the weather and the vagaries of government decisionmaking results in large and unpredictable year-to-year fluctuations.

Other Parameters

The remaining necessary parameters for the simulation of the model were estimated from a variety of sources for each country, and they are summarized in table 5. These parameters refer to the national level, and so they are not specific to any regional or income group. They were compiled generally by examining national accounts, input-output, and labor force statistics in the various countries, using some adjustments and approximations where the exact figures were not available.

III. Results of the Model

From the analysis in section I and the appendix, we derived equation 3, which enables us to simulate changes in the income of a typical member of a rural poor smallholder household. This equation was derived by constructing two Laspeyres indexes of nominal income and nominal consumer prices for each class, corresponding to the two brackets in equation 3. The index of nominal income was computed by multiplying the weights by the various producer price indexes mentioned in the previous section, where the parameters in the weights and the price series were those described in tables 2 and 4. Similarly, as shown in the second bracket of equation 3, we multiplied the index of nominal consumer prices discussed in the previous section by the weights derived from table 3. The ratio of the weighted nominal income index to the nominal consumer price index gives an index of real income for a given class of rural smallholders.

Table 6 exhibits the evolution of this index of real income for poor rural households in each country and region from 1975 to 1989. For each country and region the index is set at 100 in the first year that a structural adjustment program was implemented in each country (the first year in which a structural adjustment loan from the World Bank was approved). The index describes changes in real income arising only from relative price changes and does not incorporate changes that would arise from random fluctuations in production.

Table 6. *Index of Real Income of Low-Income Rural Smallholders in Five Countries in Sub-Saharan Africa, 1975–89*

	Côte d'Ivoire		*Ghana*		*Madagascar*			*Malawi,*	*Tanzania,*
Year	*Forest*	*Savannah*	*Forest*	*Savannah*	*Coast*	*Plateau*	*South*	*south*	*all*
1975	102.0	105.2	n.a.	n.a.	108.2	100.2	101.8	95.3	148.6
1976	103.2	110.5	n.a.	n.a.	106.8	97.6	100.0	102.6	145.3
1977	91.1	102.3	146.9	123.0	107.3	98.3	100.1	101.9	154.4
1978	116.1	119.6	88.9	88.5	107.0	97.5	99.2	106.0	164.4
1979	100.0	105.7	83.5	78.4	106.9	96.8	98.4	106.4	166.7
1980	106.9	103.9	97.5	93.1	106.8	99.2	99.6	100.0	154.1
1981	100.0	100.0	109.5	100.2	104.9	99.5	98.3	88.8	125.0
1982	98.7	99.5	101.8	100.9	100.0	100.0	100.0	101.6	134.1
1983	84.8	91.5	108.5	123.4	98.2	98.2	97.4	125.6	147.4
1984	90.3	89.8	100.0	100.0	97.8	96.8	95.7	116.2	133.9
1985	90.3	91.6	97.6	90.0	99.7	99.1	99.3	124.2	118.5
1986	97.8	96.3	89.5	85.6	104.9	104.3	108.8	118.4	100.0
1987	87.0	86.6	99.9	88.5	102.8	97.9	102.4	105.0	111.1
1988	89.3	91.7	89.1	88.0	98.5	93.0	95.2	104.2	91.6
1989	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	118.1	n.a.

n.a. Not available.

Note: The indexes for each country and region equal 100.0 in the year in which the first World Bank structural adjustment loan was approved for that country.

Source: Authors' computations.

So, for instance, in a year of drought and high food prices, the index might indicate high real incomes for typical rural smallholders, under the assumption that their production was not affected by the drought. Although this is clearly not correct, it isolates the effects of prices from the effects of random shocks on the quantities produced. Even this, however, is a simplification, because random shocks in production will affect observable prices and might bias the results. In any case, the objective of the exercise is to see if there are noticeable trends.

In Tanzania the results indicate that after the 1976–77 coffee boom, there was a decline in rural smallholder incomes, which became more acute beginning in the major crisis years of 1984 and 1985 before structural adjustment. In 1987 real rural incomes began to rise, but this was not sustained into 1988. The decline in rural smallholder incomes during the last half of the 1980s was largely attributable to the liberalization of maize meal in 1984, which led to a threefold increase in its price. This had adverse consequences on the smallholders who are net consumers and making purchases at official prices. Nonetheless, the actual decline in incomes shown in table 6 is overstated, given that many consumers were already paying the open-market price before liberalization. Without a comprehensive data series on the price of open-market maize and on the share purchased on the open versus official market, it is not possible, however, to determine the extent of the decline.

In Côte d'Ivoire, since 1981, when adjustment programs were first implemented, there appears to be a small but significant trend toward declines in real rural smallholder incomes in the forest and the savannah regions. This is especially obvious in 1987 and 1988, when the CFA franc appreciated considerably concurrent with falling world prices for cocoa and coffee. But it also reflects the contraction of the economy as a whole, which has occurred since the beginning of adjustment.

In Malawi the results also correspond to expectations. In particular, the negative GDP growth rates reported in 1980 and 1981 correspond to the low values in the index. Similarly, the index fell temporarily in 1987 and 1988 because the real prices for the major traded agricultural good, maize, and the major export crop, tobacco, were lower during those two years than at any time during the period between 1975 and 1989 (Sahn, Arulpragasam, and Merid 1990). But in addition to the movement of the income index corresponding to our expectations, it is equally important that total output and yield for all major export, traded, and nontraded goods were at best stagnant during the period covered by the model (Sahn and Arulpragasam forthcoming). This implies that neglecting to incorporate the supply response is not a serious compromise in the Malawi case.

Madagascar also witnessed no significant trend in rural incomes in any of the three regions after 1982, when the adjustment operations were initiated. This is not surprising given that the initial years of Madagascar's reform program were dedicated primarily to stabilizing the account balances through reducing absorption. In addition, an examination of government policies regarding the taxation of agriculture reveals that at least through 1987, the last year for which data are

available, the extremely high level of taxation of coffee, vanilla, and cloves had not abated during adjustment (Dorosh, Bernier, and Sarris 1990). Similarly, other indicators on the performance of the food crop sector, such as total rural rice consumption and rice production per capita, actually declined between 1982–83 and 1986–87 (Dorosh, Bernier, and Sarris 1990). This adds further credence to the results of the model, which indicate that smallholders have not been early beneficiaries from adjustment.

The most questionable results of the model regard the case of Ghana. In particular, the index of real income for poor rural smallholders suggests that incomes were highest during 1981–83. This seems counterintuitive, given that after 1984 the macroeconomic performance of Ghana was quite impressive, partially because of incentives to produce exportable crops, particularly cocoa. The explanation for the surprising results of the model is to be found by referring back to earlier tables on the structure of incomes and expenditures and price trends, recognizing the limitations of the model itself in incorporating aggregate supply response, and reconsidering the importance of rewards to nonagricultural activities that are captured in the model.

The fact that export crops, particularly cocoa, make up such a small share of overall income in the savannah (0.7 percent of total income and 1.0 percent of agricultural income) and in the forest region (6.8 percent of total income and 12 percent of agricultural income) partially explains why increased incentives to export crop producers have not resulted in higher real income for the rural poor. A related factor is the prominence of nontraded crops in income shares. In keeping with expectations about the consequence of large-scale currency devaluation, the relative prices of nontraded commodities have not been increased during adjustment. Thus there has been little increased income to households that are heavily engaged in producing roots and tubers.

The limitation of this model, which was discussed earlier, is that it does not capture aggregate increases in output that result from adjustment programs or unrelated stochastic events. This represents a noteworthy shortcoming for Ghana, given the evidence that, unlike the other countries included in the study, there have been sustained increases in aggregate output since the beginning of adjustment. In 1984 agricultural labor was significantly increased by the massive repatriation of Ghanaians from Nigeria. Most of these settled in rural areas and joined their former households, thus increasing the labor available in each household as well as the ratio of workers per dependents. This would tend to shift the typical smallholder production possibility frontier outward and would tend to improve average smallholder per capita income. The model's limitations in considering a fixed production possibility frontier are most seriously manifested in the Ghana case.

Perhaps the most interesting point in explaining the counterintuitive result for Ghana lies in reconsidering one of the innovations of the methodology used here: the incorporation of nonfarm smallholder income in the index of total real income. It would be useful to investigate whether the trends indicated in table 4 are common for different components of income. To illustrate this, we separated

the total real income index into two components, the first representing real income from agriculture and the second representing real income or rewards from nonagricultural activities (table 7). In terms of equation 3, in the first index the numerator is nominal agricultural income, which is composed of the three agricultural producer price indexes, P^p_e, P^p_f, and P^p_o, weighted by the agricultural income shares S_{ae}/S_a, S_{af}/S_a, and S_{ao}/S_a (which sum to one). The denominator is the consumer price index. In the index of real income from nonagricultural sources the numerator incorporates all five producer price indexes (P^p_e, P^p_f, P^p_o, P^p_n, and P^p_m) and their remaining (without the agricultural income shares) weights (which are divided by S_r so that they sum to one) as indicated in equation 3. The denominator is the consumer price index.

Table 7 indicates that for Ghana the major factor leading to the mild decline in real income is not a fall in agricultural income, but the decline in nonagricultural income. To the extent that adjustment programs in fact bring about shifts in relative prices that lower returns to labor, this finding is not altogether surprising. Furthermore, there was a large devaluation of the cedi in 1984, which led to a sharp rise in the cost of capital, intermediate inputs, and consumables. It is plausible that there was a sharp rise in the cost of nonagricultural activities and a subsequent decline in nonfarm income-earning opportunities for the rural poor. However, possible increases in marketing services and other forward and backward links with agriculture are not fully captured, given that aggregate output is fixed. This latter point once again admonishes caution in interpreting the results.

Examining the trends of the index of real income from agriculture and the index of real income from nonagricultural sources for other countries indicates that for Tanzania, both components of real income exhibit similar trends. In Côte d'Ivoire, although in the forest region the indexes exhibit similar trends, in the savannah region real agricultural income shows a declining trend, while nonagricultural income does not exhibit any clear direction of change. In Malawi both components of real income generally show similar trends. However, the increase in income in 1989 shown in table 6 is largely attributable to the increase in the index of real income from agriculture, which reflects the large jump in producer prices for maize and tobacco, while consumer price increases for staple tradable foods (maize and groundnuts) were moderate. In Madagascar the overall indexes do not exhibit significant trends, and this appears to be the case for agricultural and nonagricultural incomes. Therefore, it appears that, except for Ghana, the trends in agricultural real income are similar to those in nonagricultural real income.

IV. Summary and Conclusions

This article presents a model that enables us to examine trends in the real incomes of rural smallholders in several countries and regions in Sub-Saharan Africa. The results indicate that there is no unequivocal pattern of increase or decline in the real welfare of the rural poor but that there are marked differences

Table 7. *Agricultural and Nonagricultural Components of the Index of Real Income of Low-Income Rural Smallholders in Five Countries in Sub-Saharan Africa, 1975–89*

	Côte d'Ivoire				Ghana			
	Forest		Savannah		Forest		Savannah	
Year	Agricultural component	Non-agricultural component	Agricultural component	Non-agricultural component	Agricultural component	Non-agricultural component	Agricultural component	Non-agricultural component
1975	103.5	93.7	104.8	103.6	n.a.	n.a.	n.a.	n.a.
1976	104.1	96.5	110.2	108.5	n.a.	n.a.	n.a.	n.a.
1977	92.4	84.7	103.5	95.0	157.1	123.3	130.4	99.3
1978	117.2	110.7	120.6	113.4	88.8	83.6	87.3	86.1
1979	100.8	96.6	106.9	99.8	83.7	82.0	76.0	82.3
1980	107.8	103.8	104.3	102.1	98.7	100.0	94.6	93.4
1981	100.0	100.0	100.0	100.0	107.1	116.7	96.7	111.6
1982	98.1	100.6	99.5	99.6	100.4	106.9	99.2	108.0
1983	84.3	86.0	91.9	89.3	121.5	93.6	135.3	99.9
1984	90.0	90.6	90.6	85.8	100.0	100.0	100.0	100.0
1985	89.8	90.9	91.8	89.6	92.1	99.3	82.0	102.1
1986	97.1	99.4	95.5	99.4	98.9	73.3	87.6	76.7
1987	86.4	88.8	85.8	89.8	117.0	76.7	95.4	72.8
1988	88.9	90.5	91.5	92.2	102.0	69.4	94.3	71.8
1989	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Table 7. *(continued)*

	Madagascar									
	Coast		*Plateau*		*South*		*Malawi, south*		*Tanzania, all*	
Year	*Agricultural component*	*Non-agricultural component*	*Agricultural component*	*Non-agricultural component*	*Agricultural component*	*Non-agricultural component*	*Agricultural component*	*Non-agricultural component*	*Agricultural component*	*Non-agricultural component*
1975	115.8	97.0	96.0	96.8	101.2	96.6	93.6	93.6	150.7	138.4
1976	113.6	94.9	88.6	96.1	96.3	96.4	102.0	99.9	147.8	134.4
1977	114.2	97.0	93.5	95.6	99.2	95.6	101.0	99.8	156.8	145.1
1978	113.0	98.8	92.4	96.7	97.9	96.7	105.0	104.9	170.4	147.3
1979	112.8	101.2	93.5	97.3	98.0	97.4	105.0	106.6	172.6	151.5
1980	112.7	103.0	100.1	99.2	101.0	98.7	100.0	100.0	156.5	149.5
1981	108.5	102.5	101.5	98.7	99.4	97.6	87.7	89.9	126.5	122.2
1982	100.0	100.0	100.0	100.0	100.0	100.0	103.1	99.9	135.6	131.3
1983	96.4	99.6	95.8	99.7	95.1	99.7	126.9	124.0	148.9	144.5
1984	96.4	97.6	93.5	97.7	92.7	97.3	116.1	115.4	137.8	124.1
1985	99.7	97.5	98.2	97.6	98.8	97.6	123.4	123.7	118.7	117.9
1986	110.5	100.0	111.5	98.9	117.1	100.5	116.5	119.3	100.0	100.0
1987	109.9	97.2	98.0	97.4	105.9	98.7	101.4	107.9	113.0	106.8
1988	102.1	94.8	83.8	97.8	90.8	98.2	99.4	108.2	91.9	90.5
1989	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	115.5	120.0	n.a.	n.a.

n.a. Not available.

Note: The indexes for each country and region equal 100.0 in the year in which the first World Bank structural adjustment loan was approved for that country.

Source: Authors' computations.

mong countries and regions. This highlights the importance of the structure of ural smallholders' incomes and expenditures and the evolution of relative rices. However, changes in relative prices, and especially in the ratio of tradable o nontradable prices, are not sufficient indicators or predictors of developments 1 real welfare. Ghana seems to be a good case in point: although the agri-ultural exportable good prices seem to have been favored after adjustment, this as not led to major rises in the real incomes of rural smallholders in either the orest or the savannah regions.

This analysis suffers from several limitations. For example, as discussed bove, the simulation model is unable to capture adjustments to price signals nade by producers and consumers. Hence, indications that rural smallholder velfare does not change in fact might imply small improvements. Similarly, our rice indexes do not include prices for all products that make up the tradable nd nontradable groups. However, we do not believe that more detailed analysis f prices would reverse the general conclusions, since we captured a large pro-ortion of income and expenditure shares for each country. We have stopped hort of the type of modeling that is required to explain how policy has influ-nced the observed price trends and hence cannot attribute the evolution of mallholder real incomes to adjustment programs or any other specific factor. Iowever, we believe that we have shown that the issue of structural adjustment nd rural poverty is complex and that earlier efforts that arrived at simplified tatements on the harmful or beneficial effects of adjustment based on stylized acts were not useful. They failed to account for sources of income, patterns of xpenditures, and movements in relative prices in the wake of adjustment.

We have shown that the direction and level of changes in real income brought bout by structural adjustment are determined by a variety of factors. Outcomes vill be different and unpredictable without, at a minimum, a careful analysis of n extensive range of data, including the information on income, expenditures, nd prices found in this article. This is because there is considerable variation in he shares of tradables, nontradables, and exportables in the consumption bun-le as well as in the outputs of smallholders; because changes in nonagricultural ncomes can offset or reinforce changes in agricultural earnings, and these shifts re in turn conditioned by a variety of parameters that characterize the economy s a whole; and because relative prices do not move in a predictable fashion in he wake of adjustment because of the range of domestic and international ommercial and trade policies that impact upon these patterns. Further research o construct dynamic and general equilibrium models is needed to define, using ounterfactual analysis, the changes brought about by adjustment. The loss in recision in some of the simplifying assumptions in the model presented here oes not, however, detract from the fact that it indicates the direction and order f magnitude of changes in smallholder welfare in the years since adjustment rograms began. Thus, although the search for generalizations will continue, at his juncture, it is safe to conclude that there is little evidence of large welfare

gains or losses accruing to smallholders in the wake of policy reforms that have been initiated in the countries studied.

APPENDIX. A MODEL FOR ANALYZING REAL INCOME CHANGES OF RURAL SMALLHOLDERS

Consider an economy composed of two sectors: agriculture and nonagriculture. The agricultural sector produces three products (exportables, traded foods, and other agricultural products, denoted by e, f, and o, respectively) and, apart from land, uses only labor. The nonagricultural sector produces one product using labor and an imported intermediate product. Technology is Cobb-Douglas. The nonagricultural sector can be thought of as composed of a formal and an informal sector, producing largely consumer products that are imperfect substitutes in consumer preferences. The formal sector, which includes all the public enterprises, is in many analyses modeled as a fix-price nonagricultural sector; it has excess capacity and fixed nominal wages. The informal sector, composed of many individual and small-scale unincorporated enterprises, is a flex-price sector characterized by ease of entry and exit and a lot of self-employment. The two sectors are lumped together here as one sector that operates so as to maximize short-run profit.

It might appear strange to lump together two sectors that apparently behave very differently. However, from our perspective, what is of interest is that the reward to nonagricultural activities varies and that labor can shift between the agricultural and nonagricultural sectors. The labor rewards to the flex-price nonagricultural sector vary in response to labor supply and demand. However, although it might appear that nominal wages are fixed in the so-called fix-price sector (that is, the public sector), it is well known that when real wages decline there, people reduce their labor input and engage in other agricultural and nonagricultural activities. Hence a decline in the output of the fix-price sector might mean an increase in the activity of the informal sector. In the aggregate, it is reasonable to expect that the output of both sectors together will respond to total expected rewards in both formal and informal activities, and this is what justifies our assumption that the total nonagricultural sector behaves as if it maximizes profits. The profit maximization assumption is a convenient way to describe our belief that output varies with prices and that labor and other input demands will also respond to prices.

Denote by X_n the output of the nonagricultural sector, by L_n the demand for labor in the same sector, by M the amount of the imported intermediate product that is demanded in the nonagricultural sector n, by w the effective unit labor reward, and by P_m the domestic price of M. The sector will maximize profit, π, where

$$\pi = P_n X_n - wL_n - P_m M. \qquad \text{(A-1)}$$

The technology producing X_n is

$$X_n = K_n L_n^{\alpha} M^{\beta} \tag{A-2}$$

with α, β positive parameters ($\alpha + \beta < 1$) denoting the share of labor an imported intermediates, respectively, in the production of the nonagricultura products. Substituting equation A-2 into equation A-1 and maximizing, yields function for the demand for labor L_n and the demand for M. Log-differentiatin the demand for labor, we obtain

$$\tilde{L}_n = \frac{1}{1 - \alpha - \beta} \{\tilde{P}_n - (1 - \beta)\tilde{w} - \beta \tilde{P}_m\}. \tag{A-3}$$

Equation A-3 expresses how the demand for nonagricultural labor changes with changes in the price of the nonagricultural product, and its two mai inputs.

The other major labor-using sector is agriculture. Agriculture supplies labo to the nonagricultural sector depending on the relative rewards of agricultura versus nonagricultural activities. At this point, we introduce two structura assumptions that seem to be quite relevant for countries in Sub-Saharan Africa First, most agricultural production is organized along individually operate farm units. This implies that the reward of a unit of agricultural labor is o aggregate close to the *average* product of labor in agriculture. The second as sumption has to do with the types of nonagricultural activities in which the rura poor engage. They usually involve either wage employment in rural or urba areas or some type of small-scale, owner-operated enterprise. Given capita requirements, risks, and so forth, we assume that the effective reward offered b the nonfarm enterprise to a unit of nonagricultural labor is close to the effectiv reward of farm operator labor. This type of assumption has been supported b some empirical evidence (Collier, Radwan, and Wangwe 1986), and we conside it to hold true for the countries in our sample.

Given the above reasoning, the behavioral relation that will govern the suppl of labor from agriculture to nonagriculture is

$$r = w = \frac{P_a X_a}{L_a} \tag{A-4}$$

where X_a is the aggregate output of the agricultural sector, L_a is the labo employed in agriculture, and P_a is the aggregate price of agricultural output. I the production of X_a is governed by the following Cobb-Douglas relation:

$$X_a = K_a L_a^{\gamma} \tag{A-5}$$

then equation A-4 gives a relation between L_a and r. Log-differentiating tha equation, we obtain a relation between the aggregate use of agricultural labo and the nonagricultural wage:

$$\tilde{L}_a = \frac{1}{1 - \gamma}(\tilde{P}_a - \tilde{r}). \tag{A-6}$$

Under the assumed Cobb-Douglas technology, equation A-6 is also valid if the unit reward is equal to the marginal product of labor in agriculture.

The final consideration has to do with the structure of the aggregate labor market. In Sub-Saharan Africa unemployment rates are very low; they are virtually zero in rural areas, based on data from household surveys (see, for example, Glewwe 1988). The reason is that people move in and out of various low-skilled activities quite easily. Although it is more difficult to find permanent wage work in the rural sector (for example, as a public employee), even that submarket is not separated from the rest of the labor market. In fact, it is quite prevalent that underpaid civil employees are involved in other activities by effectively diminishing their labor input into their official activity. The upshot of these arguments is that it is reasonable to suggest that the labor market in Sub-Saharan Africa is characterized by full employment, which determines returns to labor.

The implication of this consideration for our simple model is that we can use equations A-3 and A-6 in an aggregate labor market clearing equation to determine $\tilde{r}$. The aggregate labor market equilibrium condition is

$$L_a + L_n = L \tag{A-7}$$

where L is exogenously given. Log-differentiating equation A-7 and using equations A-3 and A-6, we obtain

$$\tilde{r}\left(\frac{\lambda_n(1-\beta)}{1-\alpha-\beta} + \frac{\lambda_a}{1-\gamma}\right) = \frac{\lambda_n \tilde{P}_n}{1-\alpha-\beta} + \frac{\lambda_a \tilde{P}_a}{1-\gamma} - \frac{\lambda_n \beta \tilde{P}_m}{1-\alpha-\beta}. \tag{A-8}$$

In equation A-8 λ_a, λ_n are the base year shares of total labor employed in agriculture and nonagriculture, respectively.

We have abstracted from secular trends in wages caused by changes in the capacity of the two sectors (summarized by the all-inclusive indexes K_a and K_n in the model) as well as exogenous growth in the labor force. These influences could easily be included by adding to the right-hand side of equation A-6 another term $\tilde{r}^*$, where

$$\tilde{r}^* = \frac{\lambda_n \tilde{K}_n}{1-\alpha-\beta} + \frac{\lambda_a \tilde{K}_a}{1-\gamma} - \tilde{L} \tag{A-9}$$

and $\tilde{L}$ is the exogenous natural growth rate of the labor force. Lacking much information on which to empirically estimate $\tilde{K}_a$ and $\tilde{K}_n$, we simply neglect the term $\tilde{r}^*$ altogether.

Before substituting equation A-8 into our original equation 2 in the main text, we note that the log-change in the index of agricultural prices $\tilde{P}_a$ can be written as a function of the three agricultural product groups, as follows:

$$\tilde{P}_a = \sum_i b_i \tilde{P}_i^p \tag{A-10}$$

where b_i $(i = e, f, o)$ are the base year shares of each group's output in the total

agricultural output of the country. With these conventions, equation A-8 can be substituted in equation 2 in the main text to yield the following equation that will be used to trace the real welfare of a typical poor household:

$$\tilde{Y} = \left\{ \left(S_{ae} + \frac{S_r \lambda_a b_e}{(1-\gamma)\Delta} \right) \tilde{P}_e^p + \left(S_{af} + \frac{S_r \lambda_a b_f}{(1-\gamma)\Delta} \right) \tilde{P}_f^p + \left(S_{a\omega} + \frac{S_r \lambda_a b_\omega}{(1-\gamma)\Delta} \right) \tilde{P}_\omega^p + \frac{S_r \lambda_n}{(1-\alpha-\beta)\Delta} \tilde{P}_n^p - \frac{S_r \lambda_n \beta \tilde{P}_m}{(1-\alpha-\beta)\Delta} \right\} - \{\theta_f \tilde{P}_f^c + \theta_\omega \tilde{P}_\omega^c + \theta_n \tilde{P}_n^c\} \tag{A-11}$$

where

$$\Delta = \frac{\lambda_n(1-\beta)}{1-\alpha-\beta} + \frac{\lambda_a}{1-\gamma}. \tag{A-12}$$

Equation A-11 depends on structural variables that are relatively easy to estimate and on changes in price indexes that can be readily estimated. There are, nevertheless, several points of clarification and caveats about an expression such as equation A-11 that deserve mentioning. The behavioral relation equation A-4 is meant to imply that agricultural owner operators essentially equate the marginal reward to other activities with their average reward to their own agricultural activities. In other words, they regard agricultural activities as basic. In practice considerations such as risk and food security might make any specific test of equation A-4 difficult to implement. For instance, agricultural daily wages might appear higher than returns per day from own production, but we still do not observe small farmers abandoning their plots to work for large-scale operators or plantations. This implies that the effective wage, or the nominal wage adjusted for other factors, is lower than the apparent nominal wage. This is well known from the Harris-Todaro model.

Another salient feature of our assumption about sources of income of the poor rural household is that their reward to nonagricultural activities is basically assumed to be reward to the labor input. In other words, they do not share much in the aggregated profits of the nonagricultural sector. This basically means that because of ease of entry in the informal sector, whatever businesses the rural poor engage in will be mostly own labor intensive and owner operated, earning effective rewards, which, when adjusted for risk and other factors will be roughly equivalent to other labor activities.

Another assumption underlying our framework is that remittances and transfers, which in our model are included with non-own-account agricultural income, change proportionately with the unit rewards to nonagricultural activities. Private transfers and remittances are important parts of rural income in many African countries. They are usually generated by former household mem-

bers that have moved temporarily or permanently to work off-farm for wages or in their own business. If the income accruing to a rural smallholder household from remittances is regarded as reward to a portion of the household labor that is occupied with off-farm work, then it is reasonable to regard these transfers as part of non-own-account agricultural income and to include it with other nonagricultural income. If remittances come from abroad, then it is reasonable to consider them exogenous. However, the available statistics usually do not allow the breakdown of nonearned income into that originating within the country and that from abroad; in the empirical part of the article they are lumped with nonagricultural income.

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The Poor and the Social Sectors during a Period of Macroeconomic Adjustment: Empirical Evidence for Jamaica

Jere R. Behrman and Anil B. Deolalikar

Considerable uncertainty remains about the human impact of macroeconomic adjustment. Analysis of the impact of adjustment on the poor and on the social sectors is difficult because it involves evaluating a counterfactual situation in which households are affected by prices, incomes, and public services with the possibility of substantial substitutions—all within an economywide framework with complicated concurrent and lagged interactions. In this article, we utilize time-series data for Jamaica to examine whether macroeconomic adjustment, initiated in the early 1980s but intensified in 1984–85, was associated with significant deterioration in various indicators of health, nutritional, and welfare outcomes, particularly among the poor. Although we find evidence of substantial cuts in governmental expenditures on social services, there is little confirmation of significant short-run deterioration in human capital indicators during the adjustment period.

There has been much interest recently in analyzing the impact of macroeconomic adjustment and stabilization policies on poverty and on the social sectors. Some observers, such as Jolly (1985), Jolly and Cornia (1984), UNICEF (1984), and Cornia, Jolly, and Stewart (1987, 1988), have concluded that recent structural adjustment programs (SAPs) in developing economies have had substantial deleterious effects on human resources, especially those of the poor. These observers have been effective in persuading a number of influential international organizations, including the World Bank, to be more sensitive to these concerns, with the result that there has been more and more international attention paid to the human implications of macroeconomic adjustment policies.

Others, however, such as Glewwe and de Tray (1988), have argued that in many countries, particularly in Africa, most of the poor are not adversely affected by adjustment policies (and many may actually be helped) in part because

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most poor households are rural. Poor, rural households are often insulated against shocks brought about by adjustment efforts because of self-provision of many necessities, and in fact may even benefit from the relative price changes that typically result from devaluation and trade liberalization (Krueger, Schiff, and Valdés 1988; Behrman 1990b, 1990c). In a case study for Indonesia, Ravallion and Huppi (1989) and Huppi and Ravallion (1990) have shown that macroeconomic adjustment actually coincided with a significantly reduced incidence of poverty. Poverty decreased partly because of increases in agricultural export prices induced by the adjustment program and partly because of the lagged effects of previous poverty eradication efforts.

Despite the greater awareness of issues related to the effects of adjustment, considerable uncertainty remains about the human impact of adjustment, because of the analytical and methodological difficulties of measuring the effects of adjustment on the poor and on the social sectors. A full treatment of the impact would involve the evaluation of a counterfactual situation in a complicated general equilibrium framework. The evidence presented to date on this issue is not the result of such a complicated analysis, and a complete treatment also will not be attempted here. In this article, we utilize time-series data for Jamaica to examine whether macroeconomic adjustment, initiated in the early 1980s but intensified in 1984–85, was associated with significant deterioration in various indicators of health, nutritional, and welfare outcomes, particularly among the poor. The purpose of this exercise is simply to determine what actually happened to the socioeconomic position of Jamaica's poor during structural adjustment.

I. Analyzing the Impact of Structural Adjustment Programs

The impact of policy changes undertaken in an adjustment program on the human capital—particularly health, nutrition, and schooling—of the poor depends on (i) the effect of adjustment policies on the incomes of and prices facing the poor, and (ii) the effect of income and price changes on the human capital behavior of the poor.

A number of researchers have attempted to map the first relationship, namely, the theoretical linkage between the incomes of and prices faced by the poor and specific adjustment policies, such as currency devaluation, contractionary monetary and fiscal policies, wage and price controls, and foreign trade liberalization (Addison and Demery 1985; Behrman 1988; Scobie 1989; Glewwe and de Tray 1988). The consensus of this literature is that, although economic theory provides a framework for analyzing these links, the number of such links and their complex interactions make it virtually impossible to predict a priori the impact of adjustment policy instruments on the resources controlled by the poor.

The second link—namely, between changes in income or price and the household outcomes of interest, such as health, nutrition, and schooling—has been the subject of much recent research (see surveys by Behrman and Deolalikar

8, and Behrman 1990a). The economics of household decisionmaking sug- that, because of the possibility of substitution by households—among di- : sources of nutrient intakes, across the food intakes and labor supplies of :rent household members, and among various health and schooling inputs— difficult to predict the magnitude (and in some cases the direction) of the ıct of changing incomes and prices on household human capital outcomes ,out careful empirical studies. For instance, if the price of foods which are ɔrtant nutrient sources increases or incomes decrease as the result of an ıomic adjustment program, households could shift to cheaper nutrient 'ces or could reduce leakages between food they obtained and that which is ıumed by household members. Recent studies indicate that even for very r households nutrient intakes are adjusted only 1–3 percent for 10 percent ıges in income (see, for example, Behrman and Deolalikar 1987, Bouis and dad 1990, Strauss and Thomas 1990, and Behrman 1990d). Similarly, the by one member of the household of a formal sector job as the result of an stment program may be offset in part with regard to short-run income :ts by increased activities of other members of the household in the informal ɔr. To the extent that this occurs, it may be at the cost of long-run human tal investments (for example, keeping children out of school), which again difficult to predict a priori. Thus, how reduced incomes and increased con- ption prices affect the human capital decisions of the poor is largely an irical issue—one on which there is little consensus.

deed, at a certain level, the question of how macroeconomic adjustment :ts the poor is the wrong question to ask, because adjustment policies are not ıogenous, and it is possible, within limits, for a government to choose poli- that differ in their adverse effects on the poor. For instance, food subsidies cheap food policies are often the first casualties of economic adjustment ;rams. There is sufficient evidence to show that removal of food subsidies be detrimental to the poor (Pinstrup-Andersen 1985, 1986a, 1986b). How- , many food subsidy programs have almost excessively broad coverage, and · cost can be reduced without severely affecting the real income of most of ɔoor. In Morocco, for example, Mateus and others (1986) estimate that the est 30 percent of the income distribution received 47 percent of the sub- 's, and the lowest 30 percent received only 16 percent of the subsidies. ıed (1979) reports that in Bangladesh two-thirds of the subsidized grain was 'ibuted to urban areas even though most of the poor people reside in rural s. For such cases, if targeting the poor and nutritionally vulnerable is admin- tively and politically feasible at a reasonable cost, it may be attractive from ɔoint of view of structural adjustment programs. Targeted costs tend to rise fforts to limit leakages to other groups increase, but Mateus and others 36), Gavan and Chandrasekera (1979), and Alderman and von Braun (1985) e that substantial reductions in the governmental budget and distribution s of existing general cheap food policies can be achieved by effective target- Targeting measures such as subsidization of inferior foods (that is, those

that are consumed less as income increases) and direct distribution of food t those thought to be most vulnerable (for example, infants and pregnant women could result in lower budgetary expenditures on cheap food programs withou directly worsening the position of most of the poor (see also Pinstrup-Anderse and Alderman 1986, and Rodgers 1986).

A cheap food program is not the only policy related to the social sectors tha may be cut as part of an economic adjustment program. Direct cuts in healt services may have both an immediate and a long-run impact, and cuts in educa tion may have a long-run impact given some evidence regarding the direct rela tions between better education and improved health and nutrition (see, fo example, Isenman 1980; Behrman and Wolfe 1984, 1987, 1989; Rosenzwei and Schultz 1982; Wolfe and Behrman 1982, 1987). Jimenez (1987) provides recent survey of pricing policy for health and education in developing countries He concludes that the efficiency gains from user charges for selected types o health and education services (that is, those for which the benefits accrue pri marily to the individuals concerned, such as hospital care and university educa tion) could be substantial. He adds that the impact of increased user charge need not be inequitable, because "the present distribution of subsidies tends t be highly skewed toward higher income groups, who obtain greater access t more costly social services . . . even if they are uniformly free for all. Unde these circumstances, the expansionary effect of fee increases for selected service (and if possible, for selected individuals) may actually improve equity in th distribution of public resources."

Such a characterization suggests that as part of adjustment packages, socia programs in health or education could be altered through selected user charge so that the poor would not be adversely affected. Politically, this may be ver difficult, perhaps even more difficult than food targeting—and if it were done there would seem to be no good reason to reverse the process at the end of th adjustment program.

Recent studies of Indonesia (Ravallion and Huppi 1989 and Huppi an Ravallion 1990) emphasize that structural adjustment and policy reforms, initi ated in 1983 because of external macroeconomic shocks, contained element specifically aimed at sustaining Indonesia's past progress on poverty reduction. These studies conclude that the incidence of poverty continued to decline sub stantially during the initial adjustment period (namely, between 1984 an 1987). There were three main factors responsible for Indonesia's success. Th first was the ongoing growth of agricultural income that resulted from rea exchange rate depreciations that offset lower agricultural export prices, mainte nance of subsidies for agricultural inputs (for example, fertilizer and pesticides) and improvement in the rural terms of trade caused by diversification away fro rice and toward more profitable crops. The second was the combination of trad and industrial deregulation with real exchange rate adjustments, which resulte in rapid expansion of output and employment in the non-oil manufacturin sector. And the third was the maintenance of routine governmental expenditure and federal transfers to the provinces, both of which have larger poverty-

alleviation elements than development expenditures, and the reallocation of development expenditures away from industry and mining and into poverty-related sectors, such as food and export agriculture and human resource development. The Indonesian experience suggests that generalizations about the impact of economic adjustment must be tempered to take account of differential impacts depending on how an adjustment program is structured and implemented.

II. Economic Adjustment, the Poor, and the Social Sectors in Jamaica

Following a long period of macroeconomic deterioration, Jamaica initiated its structural adjustment program in 1981, with assistance from the World Bank and the International Monetary Fund. The program included, among other things, several adjustments to the real exchange rate, import liberalization, fiscal and tax reforms, and reduced government expenditures (Behrman and Deolalikar 1989). Initial implementation of the structural adjustment program was slow, with many of the policy measures being adopted forcefully only in 1984 and 1985 (Cornia and Stewart 1987).

Although there has been considerable interest in the impact of the Jamaican adjustment program on the poor and on their human resources, previous studies (Cornia and Stewart 1987; Boyd 1988) do not formalize the links between economic adjustment and the poor and their human resources. They instead use secondary data to characterize some of these links relating to unemployment, the composition of governmental expenditures, and direct indicators of health, nutrition, and education.

There are a number of methodological difficulties in rigorously assessing the impact of adjustment. Such an assessment would require the evaluation of a counterfactual situation in which individuals and households are affected by prices, incomes, and governmental services with the possibility of substantial substitutions—all within an economywide framework with complicated concurrent and lagged interactions. Because of exogenous factors, lags, feedbacks, and substitutions, simple correlations between economic adjustment policies and changes in the well-being of the poor must be interpreted with extreme care. Ideally, one would evaluate policies using a well-specified economywide model with the behavior of poor households embedded within the system. Such models, however, are rarely available.

The problem of identifying a counterfactual is even more severe. Even with a properly formulated economywide model, it is difficult to predict what alternative policies a government might have pursued, and whether their impact on the poor would have been more or less severe than the effect of policies that were actually adopted. What would have happened if no adjustment had taken place? Would the poor have been better off in the short run but worse off when (and if) the eventual collapse had come? In evaluating the impact of an adjustment program, then, the relevant comparison is not obvious.

The methodology used here is simple and, like the previous studies, ignores

many of these complex issues (which leads to limitations, as discussed below). We attempt only to establish the "facts" of whether the socioeconomic indicators of interest for Jamaica deviated significantly during the narrowly defined adjustment period (1984–85) from their underlying secular trends. Each indicator's secular trend is estimated in a simple regression, and we test for a statistically significant shift in this relation during 1984–85. Each regression is of the form, $\ln(\text{indicator})_t = \alpha_0 + \alpha_1 t + \alpha_2 t^2 + \alpha_3 D$. The linear and quadratic time terms give the secular path in the dependent variable. The quadratic time term allows for the possibility that the Jamaican economy was coming out of its long deteriorating experience in the mid- and late 1980s because of the adjustment program or for other reasons. The last term, D, is a dummy variable equal to 1 in 1984–85. If its estimated coefficient is significantly different from zero, we can conclude that the relevant indicator in 1984–85 differs from the secular trend. (We define statistical significance of α_3 via a t-test at the 10 percent level.) First-order autocorrelation coefficients also are included if they are significant, but their inclusion does not change the basic results discussed below. Although rudimentary, this "reduced-form" approach permits determination of whether the critical adjustment years differed from the preceding (and, to a lesser extent, succeeding) secular trend in terms of social indicators, as opposed to being "bad" years within a longer experience, a distinction that unfortunately is not made in much of the commentary on the impact of SAPs and stabilization programs.

This approach certainly has its limitations. Given the limited length of the available data series, we cannot examine the long-run effects of the adjustment program, some of which may still be in the making. (Our data series do not go beyond 1987.) The secular trends, moreover, do not necessarily represent the counterfactual paths that would have been followed if there had not been an adjustment program or if the adjustment program had been of a different nature. Also, the significant deviations, or lack thereof, cannot be attributed to the Jamaican adjustment and stabilization program alone, because there is no control for other contemporaneous events, such as changes in the world market for bauxite—Jamaica's leading export commodity. What this procedure reveals is whether the indicators of poverty, health, nutrition, and schooling deteriorated significantly, for whatever reasons, from their underlying secular trends during the critical adjustment years. The results may be suggestive of what the impact of the SAP was without the very difficult and expensive development of a general equilibrium model. And although we do not describe an economywide model, we do attempt to explore systematically in a limited way some dimensions of the relevant structural relations.

Boyd's summary of the Jamaican 1984–85 adjustment experience (1988, pp. 153–54) concludes:

> There is considerable evidence that economic policies . . . have served to worsen the condition of the poor in Jamaica. . . . The economic adjustment policies of the 1980s . . . have had considerable stagflationary effect. The impact on the poor has also been considerable, with decline in quan-

> tity and quality of public services on every front—health, education, housing, and water—and increasing costs for what exists. The government has sought to mitigate these effects by its welfare programme, primarily its Food Aid Programme. This . . . programme . . . has not been sufficient to offset the adverse development on nutrition arising from falling real incomes and rising relative food prices. There has been a marked increase in malnutrition among children. . . . The removal of subsidies, increasing redundancies and unemployment, and the reduction in social and economic services, inter alia, have all had direct adverse effects of significant magnitude . . .

Examination of deviations from the trends for macroeconomic indicators (table 1) provides only limited support for Boyd's characterization of the SAP impact.

Table 1. *Secular Trends and Deviations for 1984–85 in Jamaican Macroeconomic Indicators*

Indicator	*Time*	*Time²*	*1984–85*	*First-order auto-correlation coefficient*[a]	*Adjusted R^2*	*Sample size*
Foreign sector						
Current account deficit (millions of U.S. dollars)	3.360 (0.6)	−0.115 (0.8)	6.221 (4.2)	0.78 (2.4)	0.54	22
Exchange rate (Jamaican dollars per U.S. dollars)	−0.119 (1.5)	0.007 (2.8)	0.364 (3.3)	0.66 (2.8)	0.97	24
Total exports	0.406 (8.4)	−0.010 (7.1)	−0.195 (1.4)		0.78	19
Total imports	0.212 (2.7)	−0.005 (2.2)	0.001 (0.0)	0.43 (1.7)	0.83	19
Other						
GDP per capita (1974 Jamaican dollars)	−0.083 (1.8)	0.001 (1.3)	0.012 (0.5)	0.57 (4.2)	0.94	17
Gross capital formation (millions of Jamaican dollars)	0.091 (1.0)	0.001 (0.5)	0.193 (1.3)	0.68 (3.9)	0.96	24
Total government expenditure per capita (1974 Jamaican dollars)	0.239 (7.7)	−0.006 (7.1)	−0.122 (2.1)		0.84	16
Government finance deficit (millions of U.S. dollars)	1.061 (1.1)	−0.026 (1.3)	−0.037 (0.2)	0.84 (6.5)	0.96	24
Commercial bank prime lending rate	−0.017 (0.5)	0.002 (2.1)	0.152 (1.6)	0.40 (1.4)	0.93	21
Consumer price index	0.215 (5.4)	−0.002 (1.2)	0.075 (1.1)	0.41 (1.7)	0.99	17
Inflation rate	0.235 (1.6)	−0.012 (1.7)	0.902 (1.7)		0.11	17

Note: The regressions were run with the indicator in natural logarithmic form. *T*-ratios are in parentheses.

a. Included if a Durbin-Watson test indicated such correlation in the residuals.

Source: Behrman and Deolalikar (1989), appendix A.

In 1984–85, devaluation was approximately 44 percent more rapid than the trend, real governmental expenditure per capita fell 11.5 percent below the trend, and the current account increased significantly. But a number of other indicators—including real gross domestic product (GDP) per capita, the consumer price index, investment, imports, and exports—did not deviate significantly from the trend in 1984–85. Thus the evidence available suggests that the overall macro impact of the adjustment program in these years was not as negative as Boyd (1988) and Cornia and Stewart (1987) suggest.

Changes in Employment and Income

The total unemployment rate peaked in 1982 and declined monotonically thereafter with no significant deviation from the trend in 1984–85 (see table 2). Unemployment in Jamaica is defined to include both those who are actively seeking jobs and those who are not actively seeking jobs, but the results reported here hold whether total unemployment or only unemployment among job seekers is considered. Cornia and Stewart (1987) and de Tray (1985) argue that unemployment rates for women and youth are particularly important indicators of labor market conditions because these groups are more marginal labor force participants than are adult males. Female employment may be particularly related to health, nutrition, and education in Jamaica, where almost half of the households with children are female-headed. But the unemployment rates for females and for youth in 1984–85 also indicate no significant deviations from the trends. Boyd (1988) emphasizes the increasing "informalization" of Jamaican employment as evidence of deteriorating labor market conditions. The best available measure of informalization is the share of self-employed and independent workers in total employment, which rose from 39.1 percent in 1983 to 41.0 percent in 1984 and 42.7 percent in 1985. But the support for Boyd's informalization conjecture seems quite limited despite these increases, because 1983 appears to be an anomaly: in each of the four previous years the informal employment share was more than 40 percent, with the 1981 share at 42.7 percent and the 1982 share at 42.6 percent. In addition, neither the number nor the share of workers who were self-employed or in independent occupations in 1984–85 differed significantly from the trends.

Even for those in the paid labor force, of course, employment is only part of what determines income; movements in real wages are another important factor in income fluctuations. Wage data for Jamaica are quite limited, but the median wages reported in the labor force survey relative to the consumer price index are an indicator of real wages. There is no evidence of significant deviations in 1984–85 from the secular trends in the real median wages for men or for women. As discussed in detail in Behrman and Deolalikar (1989), the 1983 values seem anomalous, so that there appear to be drops from 1983 to 1984–85, but not a significant deviation below the secular trends defined over longer time periods (and, in fact, the median real wages in 1984–85 exceeded those for 1978–82). Of course, many of the poor do not receive most of their income

from wage labor. A major alternative source of income for the rural poor is agricultural production of nonexport crops. We examined all nine indicators that we could locate for nonexport agricultural quantities, prices, and domestic product, and the only significant deviation was in the GDP deflator for the agricultural sector as a whole. Finally, some of the poor receive income in the form of governmental welfare and social security transfers, but these also do not reflect any significant deviations from the trends for 1984–85. Thus the available evidence does not seem to support any significant deleterious effect coincident with the 1984–85 adjustment program in employment, real wages, agricultural income of the poor, or governmental transfers to the poor.

Changes in Education, Food and Nutrition, and Health

Cornia and Stewart (1987, p. 115) claim that "educational expenditure per head of the population aged 0–14 declined by 40 percent" (apparently from 1981–82 to 1985–86). However, we calculated the decline in real governmental expenditures on education per child age 5–14 between 1983–84 and 1985–86 to be only 0.1 percent. This sharp difference appears to reflect three factors. First, Cornia and Stewart apparently used the overall GDP deflator instead of the sector-specific deflator. Since real wages in education dropped sharply over this time period, they substantially overstate the real resource decline. Second, Cornia and Stewart refer to a longer period in which the secular trend in such real expenditure was negative, not just to 1984–85. Third, although the population grew by 2.7 percent between 1983 and 1985, the number of children age 5–14 actually declined by 1.7 percent, so that including young, non-school-aged children skews the per capita expenditure downward. In addition, regressions for available time series data on education inputs and outputs generally indicate no significant negative deviations for 1984–85, with the single exception of output of crafts, production process, and operating workers per 100,000 population (see table 3).

Private real food expenditures are available in the national accounts for ten food groups. For none of these groups is there a significantly negative deviation from the trends for 1984–85 (see table 4). Moreover, for total food, root crops, and sugar and sugar products (and for bread and cereals at the 15 percent level of significance) the deviations are significantly positive. Total food imports per capita in U.S. dollars did not deviate significantly from the trend, though there was a significant shift from meat and meat preparations to dairy products (and, at the 15 percent level, to cereals and cereal preparations). Thus average real food expenditure increased in 1984–85, and the compositional shifts tended to be toward staples, which suggests that the increased real food expenditure was not primarily the result of increases in expenditure by those at the upper end of the income distribution. Such results do not support the hypothesis of a major deterioration in food and nutrient intakes among the poor in 1984–85.

We also used the food data to estimate linear food expenditure relations and found that the elasticity of food consumption with respect to total consumption

Table 2. *Secular Trends and Deviations for 1984–85 in Jamaican Labor Market, Agricultural Sector and Government Transfers*

Indicator	*Time*	*Time²*	*1984–85*	*First-order auto-correlation coefficient*[a]	*Adjusted R²*	*Sample size*
Labor market						
Total unemployment rate	0.306	−0.008	−0.002	0.54	0.80	15
	(2.7)	(2.8)	(0.1)	(2.8)		
Males	0.058	−0.001	0.048		0.41	18
	(2.2)	(1.7)	(0.6)			
Females	0.364	−0.009	−0.009	0.67	0.86	15
	(2.2)	(2.5)	(0.3)	(4.1)		
Males age 14–19	0.234	−0.006	−0.041	−0.56	0.66	12
	(4.4)	(4.3)	(0.8)	(1.7)		
Females age 14–19	0.207	−0.005	−0.005	−0.69	0.84	12
	(11.6)	(11.3)	(0.3)	(2.6)		
Males age 20–24	0.420	−0.010	0.011		0.77	13
	(5.6)	(5.3)	(0.2)			
Females age 20–24	0.313	−0.007	0.010		0.91	13
	(9.3)	(8.8)	(0.3)			
Unemployment rate among job seekers	0.164	−0.004	0.064		0.12	15
	(2.1)	(2.1)	(0.6)			
Males	0.015	−0.001	−0.004		−0.17	15
	(0.2)	(0.3)	(0.0)			
Females	0.202	−0.005	0.069		0.42	15
	(2.8)	(2.6)	(0.7)			
Total employed persons	−0.008	0.001	0.010		0.95	15
	(0.8)	(2.5)	(0.7)			
Employed persons in self-employment or in independent occupations	0.040	−0.000	0.013		0.93	15
	(2.0)	(0.6)	(0.5)			
Percentage of all employed persons in self-employment and independent occupations	0.048	−0.001	0.003		0.69	15
	(2.5)	(1.9)	(0.1)			
Real male median wage (1974 Jamaican dollars)	−0.026	0.001	−0.114		0.02	16
	(0.6)	(0.3)	(0.6)			
Real female median wage (1974 Jamaican dollars)	−0.200	0.001	−0.118		−0.12	16
	(0.4)	(0.3)	(0.6)			
Male–female wage ratio for high-wage incomes	0.202	−0.006	0.032		0.52	16
	(4.1)	(4.3)	(0.4)			
Male median–female median wage ratio	−0.006	0.000	0.004		0.03	16
	(0.4)	(0.0)	(0.1)			
Agriculture						
Production per capita (pounds)						
Sweet potatoes	0.094	−0.004	0.236		0.21	19
	(2.0)	(1.6)	(1.1)			
Yams	−0.080	0.003	0.053	0.59	0.43	18
	(0.7)	(0.7)	(0.5)	(3.3)		
Cassava	0.110	−0.006	0.058	0.55	0.49	18
	(0.9)	(1.2)	(0.3)	(2.2)		

Table 2. *(continued)*

Indicator	*Time*	*Time²*	*1984–85*	*First-order auto-correlation coefficient*[a]	*Adjusted R^2*	*Sample size*
Gross domestic product of domestic agriculture per capita (constant 1974 Jamaican dollars)	0.021 (0.5)	−0.001 (0.6)	0.086 (1.1)	0.32 (1.3)	0.13	17
Gross domestic product of root crops per capita (constant 1974 Jamaican dollars)	−0.018 (0.2)	0.000 (0.0)	0.104 (0.9)	0.50 (2.1)	0.24	17
GDP deflator for domestic agricultural sector (1974=1)	0.093 (5.2)	0.002 (1.6)	−0.149 (1.8)		0.98	18
GDP deflator for root crops	0.101 (4.6)	0.000 (0.3)	−0.112 (1.1)		0.96	18
Share of domestic agriculture in national GDP	0.057 (1.9)	−0.002 (1.1)	0.092 (1.0)	0.21 (0.7)	0.67	17
Share of root crops in national GDP	0.056 (1.0)	−0.002 (0.8)	0.124 (1.0)	0.34 (1.2)	0.41	17
Government transfers						
Total real government expenditure on social security and welfare per capita (1974 Jamaican dollars)	−0.362 (3.3)	0.009 (2.9)	−0.062 (0.3)		0.53	16
Total real government expenditure on housing per capita (1974 Jamaican dollars)	0.961 (9.0)	−0.028 (9.1)	−0.213 (1.1)		0.88	16

Note: The regressions were run with the indicator in natural logarithmic form. *T*-ratios are in parentheses.

a. Included if a Durbin-Watson test indicated such correlation in the residuals.

Source: Behrman and Deolalikar (1989), appendix A.

expenditure is 0.74. This implies that real food expenditure would drop 1.9 percent with the 2.5 percent drop in real product per capita in 1984 and 4.3 percent with the 5.8 percent drop in real product per capita in 1985. The use of these estimated expenditure relations to predict real food expenditure suggests the possibility of some deterioration in nutrition intakes in 1984–85, even if the data from which the relations are estimated do not. But these more pessimistic estimates do not necessarily imply a serious deterioration in nutrient intakes. A number of studies of poorer populations suggest that people with more income tend to pay substantially more per unit of nutrients than do poorer people, presumably because they buy higher quality food and have greater food leakages. This result holds even though the poor sometimes pay more for food of identical quality because they cannot make bulk purchases, and even if the poor at the margin have higher propensities to purchase and to consume basic nutri-

Table 3. *Secular Trends and Deviations in 1984–85 in Indicators of Jamaican Education*

Indicator	*Time*	*Time²*	*1984–85*	*First-order auto-correlation coefficient*[a]	*Adjusted* R^2	*Sample size*
Real total governmental expenditure on education and training (1974 Jamaican dollars)	0.257 (3.0)	−0.006 (2.8)	−0.071 (0.8)	0.33 (1.0)	0.72	15
Real GDP per capita spent on private education (including University of the West Indies)	0.099 (7.4)	−0.003 (6.6)	0.007 (0.4)	0.37 (1.2)	0.94	17
Pupil-teacher ratio in primary schools	−0.072 (2.2)	0.002 (2.2)	−0.026 (0.6)		0.13	13
Pupil-teacher ratio in secondary schools	−0.075 (1.1)	0.002 (1.1)	−0.031 (0.4)		0.10	13
Capacity in primary schools	0.039 (0.9)	−0.001 (0.6)	−0.003 (0.2)	0.31 (1.9)	0.94	11
Capacity in secondary schools	0.142 (1.0)	−0.003 (0.8)	0.001 (0.0)		0.13	12
Output per 100,000 population of:						
Professional, technical, and managerial workers	0.085 (0.2)	−0.003 (0.4)	−0.016 (0.2)	0.67 (2.0)	0.67	14
Skilled and semiskilled workers	−0.201 (1.7)	0.006 (2.0)	0.176 (1.0)		0.55	15
Crafts, production process, and operating workers	0.735 (2.2)	0.020 (2.5)	−0.293 (1.9)	0.43 (2.0)	0.79	14
Number in attendance at skills-upgrading programs	−0.279 (1.4)	0.007 (1.3)	0.116 (0.4)		−0.03	15

Note: The regressions were run with the indicator in natural logarithmic form. *T*-ratios are in parentheses.

a. Included if a Durbin-Watson test indicated such correlation in the residuals.

Source: Behrman and Deolalikar (1989), appendix A.

ents out of additional income than do those who are better off (see, for example, Strauss and Thomas 1990). The 1984 Jamaican consumption expenditure survey permits estimates of nutrient elasticities with respect to total expenditure for different income ranges (table 5). For the lowest income range, these elasticities are generally between 0.3 and 0.4. These elasticities are likely to be overestimates if actual nutrient intakes as a proportion of household nutrient purchases decline with income as a result of greater food losses and more provision of food to others (for example, laborers, guests), as emphasized by Bouis and Haddad (1990), or if there is bulk purchase of staples and the reference period for the expenditure survey is relatively short, as demonstrated by Behrman (1988). In fact, if one can judge by the careful Strauss and Thomas (1990) estimates for

Brazil, the failure to control for such factors more than offsets any nonlinearities in the relationship between elasticities and income levels. Strauss and Thomas report sharp nonlinearities, but their preferred estimates indicate an elasticity of nutrient intakes with respect to income for the very poor below the estimates given here. Our elasticities imply that with a 5 percent drop in real food expenditures, nutrient intakes would drop no more than 2 percent. This does not seem to suggest substantial deterioration in nutrient intakes in 1984–85.

Of more interest than the nutrient intakes are the indicators of the impact of nutrients. The two most-cited indicators for which there are time series data are the percentage of admissions of children under five years old at Bustamente Children's Hospital because of malnutrition or malnutrition-gastroenteritis, and the percentage distribution of children age 0–3 years by the Gomez classification of normal and grades I, II, and III malnutrition according to anthropometric measures. Hospital admissions with malnutrition increased from 2.1 percent in 1983, to 2.4 percent in 1984, and to 3.7 percent in 1985, and those with malnutrition and gastroenteritis increased from 2.0, to 2.7, and to 4.7 percent in these three years, respectively.

At first sight this might seem to be strong evidence of increasing malnutrition (Boyd 1988; Cornia and Stewart 1987). However, there are five important qualifications in interpreting these data. First, the same data source indicates that from 1983 to 1984 the percentage of admissions for malnutrition and/or gastroenteritis (a third category in the original data that is not reported by Boyd) fell from 23.5 to 19.0 percent, so the slight increases noted above for 1984 may only reflect changes in categorization between malnutrition with gastroenteritis versus simply gastroenteritis. (The same is true to a much lesser extent in 1985.) Second, the patients admitted to one hospital are not likely to be representative of the affected population in different regions and classes, though it is hard to know which way this biases such an indicator. Third, the increased percentages for malnutrition and malnutrition-gastroenteritis in 1984 and 1985 reflect not only increases in the absolute numbers of children admitted for these diseases, but also a decline in the total admissions from 4,709 in 1983 to 4,512 in 1984 and 3,369 in 1985. It might be strange to conclude that this component of the changed percentages reflects that children were worse off in 1984 and 1985. Fourth, the demand for hospitalization is usually thought to be income-elastic, and thus it increases with income for a given health status, rather than vice versa. Fifth, there are not significant deviations in 1984–85 from the secular trend for such admissions (see table 4). For all of these reasons, substantial caution should be used in interpreting these hospital admissions numbers.

The percentages of children in each Gomez category of nourishment shifted in 1984 and 1985 to indicate greater malnutrition, with the percentage normal dropping from 74.2 percent in 1983 to 72.9 percent in 1984 and 1985. The decrease in the percentage share of normal children was distributed across all three grades of malnourishment. Again, some caution is needed in interpretation for several reasons. First, the quarterly variations in the data are considerable,

Table 4. *Secular Trends and Deviations for 1984–85 in Jamaican Food Consumption and Malnutrition Indicators*

Variable	*Time*	*Time²*	*1984–85*	*First-order auto-correlation coefficient*[a]	*Adjusted* R^2	*Sample size*
Real private consumption expenditure per capita (1974 Jamaican dollars)						
Food	−0.137	0.005	0.091	0.37	0.83	12
	(2.4)	(2.0)	(2.1)	(1.1)		
Bread and cereals	−0.103	0.003	0.090		0.76	13
	(3.5)	(2.5)	(1.6)			
Meat	−0.100	0.004	0.018		0.80	13
	(4.5)	(3.6)	(0.5)			
Fish	−0.087	0.003	0.084		0.41	13
	(2.5)	(2.1)	(1.3)			
Dairy products	0.045	−0.001	−0.074		0.36	13
	(1.1)	(0.6)	(1.0)			
Oils and fats	−0.152	0.004	−0.050		0.96	13
	(4.9)	(2.6)	(0.9)			
Fruits, vegetables, and legumes	−0.292	0.012	0.031	0.48	0.29	12
	(1.4)	(1.4)	(0.3)	(1.7)		
Root crops	−0.102	0.004	0.200		0.56	13
	(2.5)	(1.9)	(2.7)			
Sugar and sugar products	−0.016	−0.001	0.252		0.12	13
	(0.2)	(0.2)	(1.7)			
Coffee, tea, and cocoa	−0.318	0.011	−0.019		0.86	13
	(4.4)	(3.2)	(0.1)			
Other foods	−0.199	0.004	0.174		0.89	13
	(2.7)	(1.1)	(1.3)			
Water and sanitation	0.020	0.000	−0.096		0.39	13
	(0.3)	(0.1)	(1.2)			
Medical care	−0.146	0.006	0.052		0.34	13
	(2.6)	(2.3)	(0.5)			
Price index						
All items	0.215	−0.002	0.075	0.41	0.99	17
	(5.4)	(1.2)	(1.1)	(1.7)		
Food and drinks	0.224	−0.002	0.066	0.37	0.99	17
	(5.3)	(1.1)	(0.8)	(1.5)		
Food imports per capita (U.S. dollars)						
Total	0.028	−0.001	−0.042		−0.17	19
	(0.3)	(0.3)	(0.1)			
Meat and meat preparations	−0.082	0.003	−0.30		0.18	15
	(0.8)	(1.0)	(2.0)			
Dairy products	−0.123	0.006	0.405		0.85	15
	(0.8)	(1.6)	(1.8)			
Fish and fish products	−0.006	0.001	−0.018		0.16	15
	(0.0)	(0.3)	(0.1)			
Cereals and cereal preparations	−0.167	0.006	0.655		0.35	15
	(0.6)	(0.8)	(1.6)			
Fruits and vegetables	−0.581	0.014	−0.457		0.46	15
	(2.3)	(2.1)	(1.3)			
Malnutrition indicators						
Percentage of children age 0–3 with:						
Gomez grade normal	0.119	−0.002	−0.040		0.63	10
	(2.3)	(1.9)	(0.9)			
Gomez grade I	0.011	−0.001	0.039		−0.23	11
	(0.1)	(0.2)	(0.3)			

Table 4. *(continued)*

Variable	Time	Time²	1984–85	First-order auto-correlation coefficient[a]	Adjusted R^2	Sample size
Gomez grade II	−0.731 (4.2)	0.016 (3.7)	0.223 (1.5)		0.78	11
Gomez grade III	−0.323 (1.5)	0.005 (1.0)	0.307 (1.6)		0.70	11
Malnutrition cases as percentage of all hospital admissions	−0.142 (0.4)	0.005 (0.5)	0.122 (0.7)		0.42	10
Malnutrition and gastroenteritis cases as percentage of all hospital admissions	−0.342 (0.5)	0.011 (0.7)	0.218 (1.0)		0.58	10

Note: The regressions were run with the indicator in natural logarithmic form. *T*-ratios are in parentheses.

a. Included if a Durbin-Watson test indicated such correlation in the residuals.

Source: Behrman and Deolalikar (1989), appendix A.

and not indications of an obvious seasonal pattern. For example, the percentage normal increased from 71.3 in the fourth quarter of 1984 to 75.0 in the first quarter of 1985 and then fell back to 72.7 in the second quarter of 1985. Second, the selection procedure for measurement is not clearly random, because it apparently depends on visiting child health clinics. Third, the deviations in 1984 and 1985 from the secular trends for the Gomez percentages are not significantly non-zero (see table 4) (although Gomez grades II and III would be non-zero at a lower significance level). Thus, these two sets of indicators do not provide much confirmation of declining child nutrition.

Another aspect of these two indicators of nutritional status is how they are related to governmental expenditures and indicators of health care availability and income. We estimate these relationships (table 6), and find that none of the coefficients of the capital expenditures are significantly non-zero, as might seem plausible a priori because capital improvements are likely to have a lagged effect.

Table 5. *Elasticities of Nutrient Availability with Respect to Total Expenditure, 1984 Jamaican Consumer Survey*

Total family expenditure (Jamaican dollars)	Elasticity of nutrient availability							
	Energy	Protein	Fat	Carbo-hydrates	Iron	Vitamin A	Calcium	Vitamin C
2,000	0.37	0.43	0.54	0.32	0.37	0.34	0.33	0.40
5,000	0.14	0.24	0.27	0.08	0.09	0.21	0.19	0.00
13,000	0.04	0.15	0.11	−0.01	0.04	0.22	0.09	0.07

Note: Elasticities were calculated using the midpoints of the total expenditure ranges.

Source: Based on data in Behrman and Deolalikar (1989), table A3-8.

But three of the six coefficients of recurrent expenditures are significantl negative—those for the percentage of children with Gomez grade II and thos for malnutrition and malnutrition-gastroenteritis cases as a percentage of hospi tal admissions.

We also estimate relations for the same dependent variables with right-sid variables including real per capita GDP (with significantly negative coefficient for Gomez grade II and for malnutrition admissions), hospital beds per capit (with a significantly negative coefficient for malnutrition-gastroenteritis admis sions), and population per physician (significantly negative for the Gomez nor mal category and positive for all of the others except Gomez III) (table 7). Thes significant coefficients provide some support for the interpretation of the Gome indicators and hospital malnutrition admissions as reflecting more genera health and nutrition conditions, and thus create greater confidence that to th extent that they deviated in 1984–85, they reflect some true nutritional deterio ration, at least for children, during 1984–85.

There are a number of indicators of health inputs and health outcomes fo which time series are long enough to allow investigation of whether the value for 1984–85 differed significantly from the underlying secular trends (see tabl 8). Although no significant change in 1984–85 is noted for most of the healt

Table 6. *Selected Nutrition and Health Indicators as Functions of Recurrent and Capital Real Government Expenditures on Health*

Dependent variable	*Intercept*	*Per capita real government expenditure on health*: *Recurrent*	*Per capita real government expenditure on health*: *Capital*	*Adjusted R^2*	*Sample size*
Percentage of children age 0–3 with:					
Gomez grade normal	4.05	0.076	−0.012	−0.20	7
	(14.8)	(0.9)	(0.4)		
Gomez grade I	3.65	−0.169	0.031	−0.35	7
	(4.2)	(0.6)	(0.3)		
Gomez grade II	3.33	−0.619	0.075	0.52	7
	(4.1)	(2.5)	(0.08)		
Gomez grade III	0.03	−0.247	0.017	−0.31	7
	(0.0)	(0.6)	(0.1)		
Malnutrition cases as percentage of hospital admissions	5.21	−1.253	0.115	0.65	9
	(4.5)	(3.6)	(0.8)		
Malnutrition/gastroenteritis cases as percentage of hospital admissions	9.26	−2.406	0.041	0.76	9
	(4.8)	(4.2)	(0.2)		
Death rate (per 1,000)	1.53	−0.016	0.027	0.78	15
	(1.3)	(0.9)	(0.7)		
Infant mortality rate (per 1,000)	6.51	−0.981	−0.271	0.23	11
	(4.1)	(2.2)	(1.0)		

Note: The regressions were run with the indicator in natural logarithmic form. *T*-ratios are in parentheses.

Source: Behrman and Deolalikar (1989), appendix A.

Table 7. *Selected Nutrition and Health Indicators as Functions of Population Per Physician, Hospital Beds Per Capita, and Real GDP Per Capita*

Dependent variable	*Intercept*	*Population per physician*	*Hospital beds per capita*	*Real per capita GDP*	*Adjusted* R^2	*Sample size*
Percentage of children age 0–3 with:						
Gomez grade normal	5.51	−0.072	0.052	−0.095	0.71	7
	(3.8)	(3.9)	(0.5)	(0.4)		
Gomez grade I	−3.25	0.222	−0.239	0.690	0.77	7
	(0.8)	(4.4)	(0.8)	(1.1)		
Gomez grade II	13.02	0.234	0.380	−2.105	0.59	7
	(1.6)	(2.2)	(0.6)	(1.7)		
Gomez grade III	9.03	0.200	1.181	−1.889	−0.15	7
	(0.7)	(1.1)	(1.1)	(0.9)		
Malnutrition cases as percentage of hospital admissions	17.73	0.543	0.212	−3.221	0.79	9
	(1.6)	(3.5)	(0.3)	(1.9)		
Malnutrition/gastroenteritis cases as percentage of hospital admissions	20.80	1.010	−3.425	−3.766	0.87	8
	(1.2)	(4.40)	(2.1)	(1.4)		
Death rate (per 1,000)	−0.16	0.018	0.627	0.181	0.82	14
	(0.1)	(0.3)	(2.8)	(0.5)		
Infant mortality rate (per 1,000)	8.79	−0.621	1.633	−0.374	0.70	9
	(0.4)	(0.9)	(1.5)	(0.2)		

Note: The regressions were run with the indicator in natural logarithmic form. *T*-ratios are in parentheses.
Source: Behrman and Deolalikar (1989), appendix A.

input variables, there is a positive change in the number of beds in governmental hospitals, and negative changes in total real governmental expenditures per capita on health (indicating a downward shift of 14.6 percent) and for the capital component of health expenditure (a downward shift of 46.2 percent). These downward shifts in governmental real health expenditures are large and would seem to have negative short- and long-run implications, even though any such deduction must be qualified because of the absence of any other indicators of significant downward shifts in health inputs (and the one positive shift noted above). Indicators of health outcomes exhibit no significant deviation in 1984–85 from the secular trends. The lack of a significant impact on health outcomes may indicate that increased efficiencies in health care delivery have offset most of the short-run negative impact of governmental health expenditure cuts, but the long-term effects cannot be measured here.

III. Conclusions

In summarizing the empirical results, it should be remembered that our conclusions must be qualified because of limited data, lags in the adjustment process, and complexities, substitution, and feedback both on a micro and a macro

Table 8. *Secular Trends and Deviations in Jamaican Health Indicators, 1984–85*

Indicator	*Time*	*Time²*	*1984–85*	*First-order auto-correlation coefficient*[a]	*Adjusted R^2*	*Sample size*
Input						
Per capita real government expenditure on health (1974 Jamaican dollars)	0.336	−0.009	− 0.156		0.88	16
	(8.8)	(8.2)	(2.2)			
Recurrent	0.371	−0.010	− 0.124		0.86	16
	(8.4)	(7.8)	(1.5)			
Capital	0.303	−0.008	− 0.620	−0.21	0.23	15
	(1.5)	(1.4)	(1.8)	(0.8)		
Per capita real government expenditure on water and sanitation (1974 Jamaican dollars)	0.551	−0.018	0.175		0.37	16
	(2.3)	(2.5)	(0.4)			
Per capita real government expenditure on social sectors (health, education, housing, water and sanitation, social security)	0.285	−0.008	− 0.127		0.90	16
	(9.8)	(9.0)	(2.3)			
Percentage of children age 0–1 immunized against						
DPT	−0.362	0.011	0.074		0.55	7
	(0.2)	(0.3)	(0.3)			
Polio	0.662	−0.012	− 0.155		0.81	7
	(1.0)	(0.9)	(1.4)			
Measles	−2.471	0.060	0.180		0.82	7
	(1.2)	(1.4)	(0.5)			
BCG	0.545	−0.007	− 0.013		0.80	7
	(0.3)	(0.2)	(0.0)			
Population per public sector physician	0.161	−0.003	− 0.019		0.48	16
	(1.5)	(1.1)	(0.1)			
Population per public sector nurse	−0.059	0.002	− 0.167		0.07	16
	(0.8)	(1.1)	(1.0)			
Number of beds in government hospitals	−0.120	0.002	0.061	0.50	0.90	14
	(1.3)	(1.0)	(1.7)	(1.9)		
Number of beds in government hospitals per capita	−0.128	0.002	0.055	0.49	0.95	14
	(2.9)	(0.9)	(1.5)	(1.8)		
Real per capita GDP spent on health and medical services	−0.204	0.004	− 0.030	0.78	0.57	17
	(0.5)	(0.5)	(0.5)	(3.9)		
Imports of medicines and pharmaceuticals	0.546	−0.008	0.444		0.88	15
	(2.1)	(1.2)	(1.2)			

Table 8. *(continued)*

Indicator	*Time*	*Time²*	*1984–85*	*First-order auto-correlation coefficient*[a]	*Adjusted R^2*	*Sample size*
Outcome						
Infant mortality rate (per 1,000)	0.014 (0.5)	−0.003 (0.4)	0.346 (1.0)		0.63	9
Death rate (per 1,000)	0.014 (2.4)	−0.001 (5.3)	0.007 (0.1)		0.88	23
Incidence (per 100,000)						
Measles	0.230 (0.5)	−0.011 (0.8)	− 0.196 (0.2)		0.11	19
Tetanus	−0.261 (1.8)	0.003 (0.6)	0.127 (0.3)		0.83	18
Tuberculosis	0.030 (0.4)	−0.003 (1.4)	− 0.030 (0.1)		0.75	19
Typhoid	0.151 (1.3)	−0.004 (1.3)	− 0.152 (0.5)		−0.03	19

Note: The regressions were run with the indicator in natural logarithmic form. *T*-ratios are in parentheses.

a. Included if a Durbin-Watson test indicated such correlation in the residuals.

Source: Behrman and Deolalikar (1989), appendix A.

level. First, there is some evidence of an initial negative macro impact in 1984–85 in terms of indicators such as per capita GDP and inflation, followed by medium-term improvements. But focusing on deviations from the secular trends to see if the situation worsened significantly in 1984–85 relative to the underlying movements (rather than just whether it was bad) leads to a much less negative assessment of the situation in these years than by some previous analysts, such as Boyd (1988), Cornia and Stewart (1987), and Davies and Anderson (1987). If, in fact, the macro effects were smaller than often claimed, of course, the impact on the poor and on their human resources would also have been smaller.

Second, the negative short-run effects on employment and distribution also seem limited, and again more limited than suggested by other observers. Most of the short-run impact on employment, in fact, seems to have been neutral or positive, without significant negative deviations from the secular trends even for the most vulnerable demographic groups, such as youth and women. Moreover, the efforts to keep food prices low for the benefit of consumers possibly had an ongoing negative impact on the incomes of some of the poorer Jamaicans in agriculture, though the evidence on this possibility is limited. Governmental transfers and services almost certainly fell in real terms, though not so much from the underlying trends, as is often suggested; and in Jamaica, as in other countries, these programs tend to affect middle-income groups much more than the poorest.

Third, governmental expenditures on social services undoubtedly declined in real terms, and in the aggregate in 1984 and 1985 they were significantly below the trend. Nevertheless, the evidence of short-term deterioration in these sectors is limited. Only one out of ten educational indicators shows a significantly negative deviation for 1984–85. Real per capita food expenditure seemed stable despite income declines and real food price increases, perhaps in part because of some success in food programs. The small nutrient elasticities with respect to total food expenditure suggest that part of the explanation for nutritional developments was the substitution of lower-cost nutrients for more expensive ones (a pattern also observed in food imports), which may result in some important welfare losses, but relatively small nutrient intake deterioration for most Jamaicans. Nevertheless, there is some evidence, despite considerable qualifications about the data, of some nutritional deterioration for small children, though probably with subsequent recovery after 1984–85. For nonnutrient health-related indicators of inputs and outputs, there were about as many positive as negative changes in 1984–85, and very few significant deviations from the trends, despite drops in real governmental health expenditures per capita.

Concerns about the impact of adjustment on the poor and on the social sectors have multiplied and are more and more at least part of the policy discussion, if not always a part of policy design and implementation. Adjustment programs may have deleterious effects on the poor and on the social sectors, but the empirical evidence presented to date is not very convincing as a result of confusion about levels, trends, and deviations from the trends as well as questionable data interpretations. More careful and thorough analysis that clarifies the impact of alternative adjustment policies on the poor and on the social sectors and identifies policy instruments with which to cushion the poor from the adverse effects of adjustment will be needed, because macroeconomic adjustment will continue to be a reality in much of the developing world.

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Optimal Poverty Reduction, Adjustment, and Growth

François Bourguignon

This article analyzes poverty reduction policies in an applied optimal growth framework. Assuming that poverty reduction is effected through redistribution, it focuses on the static and dynamic tradeoffs between equity and efficiency and on the choice between current income and future income (that is, current productive asset) transfers to the poor. By numerically estimating a stylized economy, it is shown that, given reasonable assumptions about behavioral parameters, the efficiency cost of poverty reduction in an economy on a steady growth path is relatively low. In a period of adjustment following a severe exogenous shock, however, the scope for redistribution may be extremely limited if there is a constraint on foreign borrowing. Plausible examples are given of adjustment cases in which poverty reduction becomes optimal only after partial adjustment has been achieved.

Consider an economy that has undergone a severe and permanent adverse shock, such as a drop in its terms of trade or an increase in the interest rates on its foreign debt. As a result of the shock, mean income falls and poverty increases. Adjustment to the changed environment requires that output rise in the traded sectors in which relative prices are higher. Because resources cannot be rapidly and smoothly transferred between sectors, the rate of investment must rise. If the country does not have access to new foreign capital, higher investment necessitates an increase in the domestic savings rate, which further reduces consumption and increases poverty. Achieving efficient levels of output may therefore conflict with poverty alleviation during an adjustment period.

Concern for efficiency appears to have outweighed poverty consideration in most of the adjustment programs implemented by developing countries in the early 1980s. This neglect of poverty alleviation may have stemmed from a failure to recognize that adjustment can be a long-term process that benefits the poor only after several periods and that, furthermore, may be jeopardized if its

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interim social costs are considered too high. If alleviating poverty through overall growth requires an unacceptably long waiting period, explicit redistributive policies may have to be undertaken. There is now more and more recognition of the importance of the social, or redistributive, dimension of adjustment (for studies undertaken under the auspices of international agencies, see Heller and others 1988; Country Economics Department 1989, 1990; and Cornia and others 1987) and the lack of criteria by which to determine the weight that adjustment programs should attach to that dimension. Suppose policymakers' intertemporal social objectives involve both efficiency (a concern for the growth of per capita consumption) and equity (a concern for increasing the consumption of the poorest members of society). The problem for policy is to determine the amount of present and future resources to devote to alleviating poverty, knowing that the resulting resource allocation may slow the pace of structural adjustment and reduce attainable growth.

The present article explores this issue with the help of a numerical model based on a highly stylized analytical framework. Orders of magnitude for tradeoffs between efficiency and equity during an adjustment period are assessed, and some rough rules on when and how to undertake poverty reduction policies are provided. Many of the general conclusions of the model are derived from the theoretical literature on optimal growth and income distribution developed in the 1970s (see for instance Hamada 1967, Sheshinski 1976, Pestieau and Possen 1978, and Stanley 1978). Basically, these models conclude that income redistribution policies must strike a balance between equality and growth: because the marginal savings rate increases with income, a progressive income tax will lower average savings and the ratio of steady-state capital to labor, which would reduce growth. The standard models are mostly concerned, however, with the implications of income redistribution on steady-state growth. Their analytical results cannot, therefore, capture the growth effects of redistribution policies aimed at poverty alleviation during adjustment. The present model takes account of the poverty and adjustment features by integrating, although in a highly simplified fashion, three major aspects of antipoverty policy that have not previously been incorporated in a single analysis.

The first aspect is the tradeoff between efficiency and equity at a given point in time. This tradeoff arises from two related costs of transfer policies aimed at alleviating current poverty: the distortionary efficiency costs of non-lump-sum transfers and the leakage resulting from necessarily "imperfect targeting" of the poor. Real-world transfers are rarely lump-sum and therefore provide individuals with incentives to adopt inefficient behavior. Leakages result, first, because it is not administratively possible to distinguish perfectly between the poor and nonpoor, so that richer groups benefit from transfers intended for the poor, and, second, because the taxes financing those transfers are in part borne by the poor. Such leakages increase the resources required for poverty alleviation and hence raise its efficiency cost.

The second aspect is essentially an intertemporal tradeoff that has been the focus of the theoretical literature on growth and distribution. Redistributing current income from the rich, or the nonpoor, to the poor is likely to reduce domestic savings, however the redistribution is made. But, in the absence of external capital, adjustment and, more generally, growth require higher domestic savings for increased investment. Redistribution that achieves less poverty and lower savings in the present therefore implies less income, and thus more poverty, in the future. This argument does not take account of the possibility that poverty alleviation policies that improve nutrition, health, or education, for example, may improve labor productivity and hence themselves contribute to growth. This possibility is in part recognized by the third aspect.

The third issue confronting antipoverty policy is a strategy choice: whether poverty should be reduced through current income transfers or through investment in the poor (that is, expenditures that contribute to human capital formation). The latter "growth with redistribution" (as in the title of the 1974 book by Chenery and others) strategy can reduce the intertemporal conflict between equity and growth. But two caveats should be noted. First, this strategy may not alleviate current poverty, and, if financed from additional taxes that affect the poor, it may even temporarily increase poverty. Second, investment elsewhere in the economy may be more productive than assets transferred to the poor.

If we are to assess the overall tradeoff between growth and poverty-reducing redistribution during adjustment, these three aspects of policy must be considered in a common analytical framework. The required intertemporal framework is necessarily complicated, and the most simple, stylized specifications are therefore adopted. Even with these, however, analytical results describing the properties of the optimal redistribution policies are only obtainable if the analysis is restricted to steady-state growth situations—equilibriums that are particularly irrelevant when studying adjustment episodes. Because realistic, generalizable results cannot be obtained, the framework is analyzed numerically to illustrate the tradeoffs it suggests in a highly stylized version of the real economy. The framework is part of a preliminary exploration of the possible growth costs of a poverty reduction program during adjustment, when contemporaneous and intertemporal tradeoffs and alternative (consumption- versus investment-type) redistributive policies are taken into account.

The article is organized as follows. Section I presents the analytical features of the model to be used and its functional specifications. The empirical implementation of the model is briefly discussed in section II. Section III is devoted to comparative dynamics experiments with the various policy instruments considered in the analysis and derives a measure of the tradeoffs under analysis. Section IV explores the optimal redistribution policies that follow from alternative assumptions about the intertemporal social objective of policymakers and the characteristics of the adjustment process. The policy implications and possible extensions of the analysis are discussed in section V.

I. The Analytical Framework

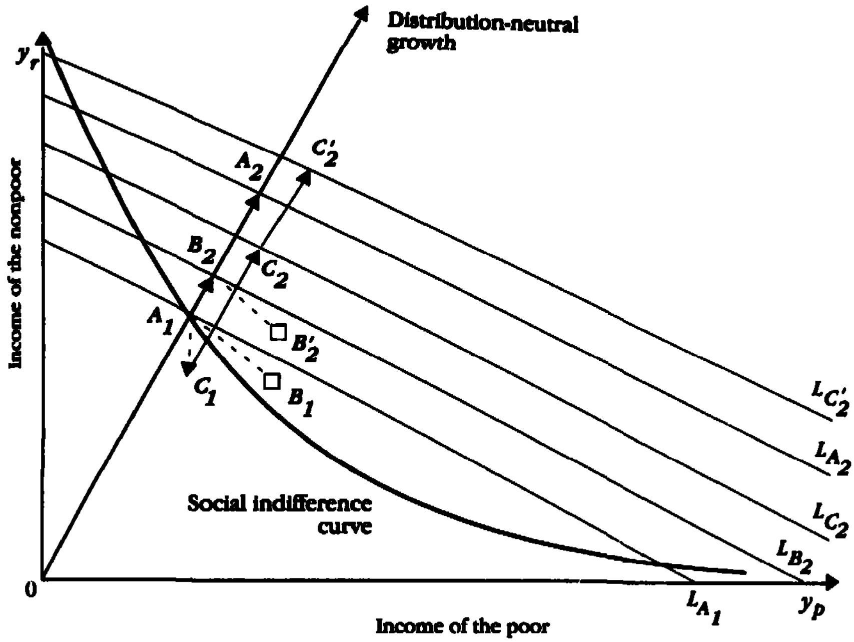
A simple geometric representation (figure 1) of the tradeoffs involved in poverty reduction policies will help in understanding the structure of the model used throughout this article.

The economy has two classes of agents, the poor with income y_p (represented on the horizontal axis) and the nonpoor with income y_r (represented on the vertical axis). The population shares, n_p and n_r, of each class are assumed constant, so that a change in poverty is represented by a change in y_p. Each line L with (constant) slope n_p/n_r thus corresponds to a given aggregate income. The economy is initially at point A_1 on the ray through the origin to the left of the 45 degree line (not illustrated). Because y_p is defined as the income of the poor, it is being implicitly assumed that y_p is less than (and y_r greater than) some minimum acceptable level of income (the poverty line defined in terms of income). With an equal initial distribution of income (so that the economy is on the 45 degree ray), poverty would be represented by an aggregate, and hence mean, level of income at or below some minimum L line. Without any poverty reduction policy, the saving and investment process would lead the economy to point A_2 at some period in the future. A_1A_2 is straight rather than curved because growth (or successful adjustment) is assumed here, for simplicity, to be "distribution neutral." In other words, relative individual income remains unchanged without policy intervention.

Figure 1 illustrates static and intertemporal tradeoffs under the two alternative redistribution strategies discussed above. Redistributive policies that aim to reduce contemporaneous poverty by transferring current income to the poor are considered first. The static tradeoff between poverty reduction and efficiency is represented by the move from A_1 to B_1. In B_1 there is less poverty because the income of the poor is higher, but the mean income in the population is also lower: that is, B_1 is below the line L_{A_1}. The difference between the slope of the segment A_1B_1 and that of lines L represents the contemporaneous marginal efficiency cost of reducing poverty, that is, both the leakage that results from imperfect targeting and the distortionary effects of transfers. The relative slopes of A_1B_1 and L_{A_1} determine whether a poverty reduction policy should be undertaken; if B_1 lies on a higher social indifference curve than A_1, as in figure 1, current transfers to the poor are preferred to nonintervention.

The intertemporal tradeoff is represented by comparing the no-intervention growth path A_1A_2 with the path A_1B_2, where B_2 represents the gross income of both classes in period 2 that results from the redistribution A_1B_1 in period 1. The redistribution of current income is assumed to leave the primary distribution of incomes unchanged: B_2 lies on the ray $0A_1A_2$. The dynamic cost of current income transfers is represented here by the position of B_2 below A_2: at B_2 mean income per capita is smaller and the poor are worse off than at A_2. Of course, it is still possible to redistribute income at B_2. This is illustrated by the move from B_2 to B_2'.

Figure 1. ***Static and Intertemporal Tradeoffs between Equity and Growth Resulting from Alternative Poverty-Reducing Redistribution Strategies***



Note: Lines L represent various levels of aggregate income. A_1 is the initial position of the A_2 indicates the income state that would occur without policies to reduce poverty. Points B_t, $t = 1,2$, represent period 1 and 2 states resulting from transfers of current income to the poor. Points C_t, $t = 1,2$, represent states resulting from expenditure for human capital formation among the poor.

The economic states (levels and distribution of aggregate income) resulting from a capital transfer strategy are illustrated by the points C_1 and C_2. The fall in aggregate income represented by the path A_1C_1 corresponds to the distortionary cost of period 1 redistribution. Because it is assumed that the poor receive no current income with this strategy, both poor and nonpoor lose in the first period, in contrast to the distributive gains to the poor with an income transfer strategy. An asset transfer strategy may reduce poverty in period 2 through the income redistribution brought about by the initial asset transfer to the poor: the path A_1C_2 lies below the path A_1A_2, representing higher relative incomes among the poor. But it may be costly in terms of growth—C_2 may lie below L_{A_2}, as in figure 1, if investment in the poor is less productive than investment elsewhere in the economy. If this is not the case, the conflict between (dynamic) redistribution

and growth would disappear: investment in the poor would produce a Pareto-superior outcome in which both classes are better off relative to the nonintervention case. This possibility is illustrated by the point C_2'.

The model we now present provides a more detailed description of the trade-offs represented in figure 1 by comparing the pairs of points A_1 and B_1, A_2 and B_2, and A_2 and C_2 and, for a given social welfare function, determines what combination of A_2, B_2, and C_2 is optimal.

The model has five basic components: a production function, an efficiency loss function that measures the output costs of taxation, a distribution submodel describing the allocation of total gross income among classes, a set of parameters describing tax and transfer policies, and a social welfare function.

The Production Function, the Tax Loss Function, and the Adjustment Process

The main state variable in the model is the total per capita capital stock, k. Gross income per capita, x, is a product of per capita production and a scale parameter, α, less proportionate losses from non-lump-sum redistribution, and is given by

$$x = \alpha \cdot f(k) \cdot [1 - L(T)] \tag{1}$$

where $f(k)$ is a standard production function, and α, the scale parameter, will be used to represent the structural adjustment process. T is the mean tax rate, and $L(T)$ is the loss function that indicates the share of total income lost because of the tax-financed redistribution policy. By assumption, taxation cannot be lump-sum. It thus entails economywide deadweight losses and distortionary costs that increase with the share of total income being redistributed. For this loss function to be meaningful, the income concept in equation 1 must be defined as some money-metric of the mean welfare level in the population rather than the mean monetary income actually accruing to the population.

The loss function is reasonably assumed to be convex, that is, the marginal welfare cost of taxation increases with the average tax rate. For simplicity, a quadratic specification for $L(T)$ is adopted:

$$L(T) = T[c + (1 - c)T] \tag{2}$$

where c, $0 < c < 1$ is a parameter that determines the size of the marginal welfare loss of taxation. This specification ensures that the loss is zero without taxation (c is then the marginal loss of output) and tends toward unity as the tax rate goes to 100 percent.

Structural adjustment will be represented by shifts in the scale parameter, α, of the production function. This use of α to describe the adjustment process is adapted from the growth literature's treatment of technical progress. Specifically, it is assumed that α converges toward its efficient long-run level, α^0, at a rate that is a product of three factors: first, whether, and by how much, investment per unit of capital, i/k, is above some minimum level, e; second, for given i/k, the exogenous speed of adjustment, v; and third, the amount by which the

initial adverse shock has depressed α below α^0, that is, $(\alpha^0 - \alpha)$. More precisely, denoting the change in α per unit of time by $\alpha = d\alpha/dt$, we assume that

$$(3) \qquad \dot{\alpha} = \nu(\alpha^0 - \alpha)\,\text{Inf}\,\{i/k - e, 0\}$$

where ν, α^0 and e are constant parameters, and i is gross investment per capita.

This specification is an ad hoc way of representing the following process. The need for structural adjustment implies that resource allocation in the economy is initially inefficient, possibly because of a recent permanent shock in the economy's foreign environment (in its terms of trade, for example); in other words, α has been shocked below α^0. In the short run, capital (and labor if the scope for technical substitution is limited at the sectoral level) cannot be freely moved between sectors. Resource reallocation is therefore a dynamic process that occurs through new (gross) investment. The speed at which the economy adjusts to its new, efficient growth path, where $\alpha = \alpha^0$, thus depends either on the rate at which the capital stock is expanded or renewed (the term i/k) or, as assumed in equation 3, on the difference between that rate and some minimum value, the constant e, which represents the level of the investment rate below which natural rigidities constrain capital reallocation. The Inf function in equation 3 captures the implication that no adjustment takes place below e, that is, at any $i/k < e$, $\alpha = 0$. The function $\alpha^0 f(\;)$ may thus be interpreted as the new aggregate production function when factor reallocation has been achieved. Changes in α represent the progressive adjustment toward this new efficient growth path of the economy.

Equation 3 models the structural adjustment process as a temporary increase in the marginal product of capital after a once-and-for-all drop in total output because of an adverse shock. Equation 3 suggests some nonconvexity of the production set (see Romer 1986 and Lucas 1985); however, here increasing marginal returns are only local or temporary. Output increases along the adjustment path because investment increases both the stock of capital, k, and its marginal product through its allocative efficiency, α. This specification, although ad hoc, captures the aggregate implications of situations in which early investment is unusually productive. It is especially appropriate if output is constrained by a lack of foreign exchange, which is common in adjustment episodes. Consider, for example, an economy that is temporarily off its production frontier because it has a foreign exchange shortage and no access to foreign capital. In these circumstances, any investment in the tradable sector not only raises output in that sector but, by relaxing the foreign exchange constraint, increases output in the nontradable sector. The specification illustrated by equation 3 is an aggregate representation of such a situation, but it also applies to less extreme cases.

Income Distribution and Capital Accumulation

The following formulation of the relation between growth and income distribution draws on Stiglitz (1976), Bourguignon (1981), and Ahluwalia and Chen-

ery (1974). Rather than considering just two classes, as in figure 1, the population is here divided into three classes of homogeneous individuals: the poor, the middle-income, and the rich. Having three classes will allow us to take account of some constraints associated with redistribution policies. The demographic growth rate is assumed to be the same in the three classes, so that their weight, n_i ($i = 1, 2, 3$), in the total population is constant over time. The three classes differ in their initial holdings of physical and human capital, k_i. The relative values of the k_i, and thus the income definition of the three classes, may change along the growth path. However, this is unlikely to happen to any significant extent over the limited time horizon analyzed here. In each class the gross income, x_i, of an individual is given by the sum of the returns to his labor, w, and to his capital, rk_i:

$$(4) \qquad x_i = w + r \cdot k_i \qquad i = 1, 2, 3.$$

Human capital is included in k_i so that w is the wage rate paid to undifferentiated labor and may reasonably be assumed to be constant across classes.

It is assumed here that wage and profit rates are proportional to the values that would correspond to the competitive equilibrium defined by the long-run production function $\alpha^0 f(\ )$. In other words, it is assumed that the adjustment process (as represented by changes in the shift parameter, α) and efficiency losses resulting from the transfer policy (the term $1 - L$ in equation 1) affect the remunerations of labor and capital in the same way. Thus neither the adjustment process nor efficiency losses affect the distribution of income. This assumption, although highly debatable a priori, allows the model to focus on redistribution for poverty reduction, abstracting from endogenous changes in the distribution of gross income.

The distribution of gross income is completely specified by equation 4, and the wage and profit rates are given by:

$$(5) \qquad w = \alpha(1 - L)\,[f(k) - k \cdot f'(k)]$$

$$(6) \qquad r = \alpha(1 - L) \cdot f'(k)$$

where $\alpha f'(k)$ is the (gross) marginal product of capital. The model is closed by the aggregation relationship for capital:

$$k = \sum_i n_i \cdot k_i$$

which, because the wage rate is assumed constant across classes, implies

$$x = \sum_i n_i x_i.$$

Net individual incomes deduct tax from, and add transfer payments to, gross incomes. Denoting by τ and σ indexes representing the extent of taxation and redistribution, respectively, let $\tau \cdot t(x_i/x)$ be the total taxes paid and $\sigma \cdot z(x_i/x)$ the

ıefits received by an individual whose income is x_i. The term $t(\ )$ repre-
: progressivity of the tax system, and $z(\ )$ the progressivity of the benefit
The terms $t(\ )$ and $z(\ )$ are defined as functions, increasing and decreas-
ɛctively, of relative income x_i/x, rather than of absolute income, so that
;ressivity of the tax and benefit systems is not affected by growth. The
g simple logistic specifications have been selected for the tax and benefit
.s:

$$\tau \cdot t(x_i/x) = \tau(x_i/x)^b/[1 + (x_i/x)^b]$$

$$\sigma \cdot z(x_i/x) = \sigma/[1 + (x_i/x)^d]$$

and d are fixed coefficients representing the "targeting" capacity of
tax and benefit instruments: zero values for b and d imply that $t(\ )$ and
:onstants and that it is therefore impossible to target taxes and transfers.
ɛxes τ and σ are related to the mean tax rate, T, and the mean benefit
by the following equations, which average the taxes (8a) and benefits
he three classes:

$$T = \left[\tau \sum_i n_i x_i t(x_i/x)\right]/x$$

$$Z = \left[\sigma \sum_i n_i x_i z(x_i/x)\right]/x.$$

erms T and Z, or τ and σ, are policy instruments, whereas the pro-
y indexes b and d are assumed given. In other words, policymakers are
hoose how much to take from households and how much to redistribute
, but they cannot choose how progressive their redistribution will be. A
ıtion that makes the progressivity described by $t(\ )$ and $z(\ )$ itself a
of the mean tax and benefit rates T and Z is probably preferable but
omplicate the analysis (see Kakwani 1976, Bourguignon and Morrisson
ıd Morrisson 1980). In net terms, however, the overall progressivity of
benefit system is variable. The net income in class i, y_i, is given by
ing taxes from, and adding transfers to, gross income:

$$y_i = x_i - \tau \cdot t(x_i/x) + \sigma \cdot z(x_i/x).$$

ıg a given amount of public expenditures may thus be achieved with
combinations of τ and σ (or T and Z) that do affect net income
tion.

ırogressivity of taxes and benefits have been treated separately, rather
ining a unique net transfer function, because it permits us to account for
leakages from the redistribution system (arising from imperfect tar-
nd the distortionary costs of non-lump-sum redistribution) in a simple
ppose the government wants to transfer an additional dollar to the poor
= 1). Its budget constraint—see equation 11 below—requires that an

additional dollar be obtained through taxes. The function $t(\;)$, however, may be nonzero for x_1/x (that is, the poor may pay indirect taxes) so that the poor will actually receive less than a dollar in net terms. More than a dollar in taxes must be raised to permit them to receive one dollar net. This increases the efficiency loss L in equation 1, so that the amount that must be transferred to reach the initial redistribution objective will be still larger. Because the loss function $L(\;)$ is convex, there is a natural limit to the amount that may be redistributed.

The dynamic behavior of individual incomes is given by the accumulation of physical and human capital. Let $s(y_i/y, y_i)$ be the savings function of an individual with (net) income y_i. Capital accumulation in class i is specified as total saved income, $s(\;)y_i$, and accruals on asset transfers, h_iH_i, for that class—given that public investment increases the return on private investment by q—less net capital depreciation, nk_i:

$$(10)\quad \dot{k}_i = (1 + q) \cdot s(y_i/y, y_i/y_{0i}) \cdot y_i - n \cdot k_i + (1 + q) \cdot h_i \cdot H_i \qquad i = 1, 2, 3.$$

In equation 10, y is mean net income, n is the demographic growth rate (plus the depreciation rate of capital), H_i is the assets transferred by the government to class i, h_i is the productivity of those assets, and q is the (constant) ratio of public to private investment. A detailed examination of the terms in this expression is helpful.

The function $s(\;)$ refers to the aggregate savings behavior of a class rather than to the behavior of the individuals belonging to that class. As such, it does not rely on the standard intertemporal or life-cycle microeconomic framework. Following most of the literature on the tradeoff between equity and growth and given that empirical (cross-sectional) studies support the assumption, the long-run marginal savings propensity is assumed to be an increasing function of the relative income of a class, y_i/y. The second argument in $s(\;)$ represents a short-run departure from the long-run value of the savings rate resulting from a fall in current income. It is intended to capture the idea that, with some inertia in behavior, savings rates may temporarily fall below their long-run levels because individual incomes are depressed from their initial value, y_i^0, at the beginning of the adjustment period. With time and growth, savings rates are assumed to return progressively to the long-run values determined only by relative incomes, that is, when $y_i \geq y_i^0$, $s(\;) = s(y_i/y)$. The following specification of the savings function, which is used in our numerical experiments, reflects this idea:

$$(11)\qquad s(y_i/y, y_i) = \{s_0/[1 + u\,(y_i/y)^{-m}]\}\, M(y_i/y_i^0, u).$$

In this specification u stands for time and $M(\;)$ is a function tending toward unity with both its arguments. The logistic term in equation 11 that gives the long-run value of the savings function, provides a means of representing approximately constant long-run savings propensities at both ends of the income distribution through the coefficients m and u, and ensures continuity in y_i/y. This facilitated the numerical calibration of the model.

The potential results of alleviating poverty through asset, rather than income,

transfers are represented by the H_i variables. For a given budget a choice must be made between increasing the income transfer, Z, part of which is going to the poor, and increasing the asset transfer, H_i. As it stands in equation 10, there is no explicit leakage effect in the latter transfer; that is, targeting is perfect. However, the parameters h_i allow the productivity of the transferred assets to be taken as lower (or higher) than that of other capital goods. The term h_i thus may reflect possible inefficiencies or costs in the asset transfer process.

The parameter q in equation 10 stands for the public component of investment. It is assumed here that public investment is strictly complementary to assets accumulated by, or transferred to, the private sector: a unit increase in private investment elicits q units of public investment. Its productivity is assumed to be the same as that of private capital, so that public investment basically increases the return on private capital by a factor $(1 + q)$. This seemed a simple way of accounting for the activity of the public sector and corresponding financing requirements, even though it excludes the possibility that the economy could expand through public investment.

The Government Budget Constraint and the Social Welfare Function

A similar desire for simplicity also explains the complementarity assumption made for current public expenditures. These are specified as a fixed proportion, g, of output. This does not really restrict the generality of the model. The government may still alleviate poverty through additional specific public expenditures—health programs, for instance—which are implicitly accounted for by the transfer variables Z and H_i. This means that the complementarity between current public expenditures and output refers only to those expenditures that are not directly concerned with redistribution.

Collecting the public expenditure terms (on the left-hand side) and the revenue terms (on the right), the current budget constraint of the public sector is (in per capita terms):

$$(12) \qquad Z + \sum_i n_i \cdot H_i + g \cdot x + (q/1 + q) \cdot \sum_i (k_i + nk_i) = T + F$$

where F stands for exogenous receipts from the rest of the world. Their inclusion in equation 12 implies that the economy's access to foreign capital is assumed to be constrained to the exogenously available levels at any point in time. Foreign capital inflows, F, would otherwise vary with public financing needs and would be constrained only by some intertemporal indebtedness condition involving foreign interest rates.

The preceding budget constraint includes all the policy instruments considered in the present model: the transfer rate, Z; the asset transfers, H_i; and the tax rate, T. When dealing with optimal policies, the selected values of these instruments will be those which maximize the social welfare function obtained by adding the present value (discounting at rate θ) of welfare, in each period, U,

to the discounted utility of the terminal capital stock, $V(k^A)$. This social welfare function, W, is given by

$$(13) \qquad W = \sum_{u=1}^{A} U(1+\theta)^{-u} + (1+\theta)^{-A} \cdot V(k^A)$$

where u indexes time, A is the time horizon, and $V(\ )$ is the utility of the terminal capital stock. U is the instantaneous welfare function and is defined on individual consumption expenditures, adopting the usual isoelastic specification:

$$(14) \qquad U = \frac{1}{1-\epsilon} \Sigma n_i \left\{ y_t \cdot [1 - s(y_i/y, y_t)] \right\}^{1-\epsilon}.$$

The coefficient ϵ is a measure of society's aversion to inequality. If that coefficient is equal to zero, policymakers do not care about the distribution of income and simply seek to maximize total discounted consumption per capita. If, on the contrary, ϵ is very large, only the level of consumption of the poorest in society matters for social welfare; this is the Rawlsian criterion (see Atkinson 1970).

The specifications of equations 13 and 14 are conventional in the optimal growth and the optimal tax literature. Optimization should ideally be performed on an infinite time horizon. Obviously, this is impossible numerically. The terminal utility function, $V(k^A)$, which prevents the optimal policy from depleting the entire capital stock at horizon A, is therefore required. In the numerical experiments, this function was obtained as the discounted social welfare, derived from equation 14, over an infinite steady growth path, starting from the income levels obtained at horizon A, where A is taken to be fifteen years from the initial period. The optimal policies at the beginning of the experimental period were checked and found to be largely insensitive to this terminal utility function or the time horizon.

The preceding social welfare function is defined in terms of inequality rather than in terms of poverty. It would have been possible to single out the poverty issue by explicitly introducing some poverty measure, together with mean consumption per capita, into the social objective function. Disregarding the fate of the middle class by aggregating it with the richest class, however, seems to ignore a possibly important constraint in poverty reduction policies in any country: namely, that the middle class may be the major political obstacle if a drastic redistribution policy is required to alleviate poverty.

The description of the model is now complete. In concluding the discussion of the analytical framework, it is important to stress the fundamental role played by the efficiency loss function, $L(T)$. Without such a function, or if it were not convex, the optimal policy would simply be to equalize all incomes, and the model would be equivalent to the well-known one-sector model of the optimal growth literature. If one wants to deal meaningfully with distribution issues, one must first understand why nonegoistic policymakers would never try to impose such perfect equality of incomes. There are two fundamental reasons; the first has to do with political economy, the second with efficiency costs. It is in the

spirit of the present exercise to favor the efficiency cost argument, and use of the function $L(T)$ allows us to model such costs in a tractable way.

II. Numerical Estimation of the Model

Although the preceding model describes the main elements of poverty reduction (through redistribution) policies in the simplest fashion, it is already far too complex for an analytical solution to be feasible. Its properties are therefore analyzed numerically. In this section, we report the solutions obtained from running the model under the assumption that no redistribution measures are in place. The resulting base-runs are used in section III to assess how redistribution policies affect output growth and other model variables. The values assigned to variables and parameters in the model are mainly based on Venezuelan data. Of course, given the greatly simplified nature of the model, the result is a highly stylized representation of Venezuela. Nevertheless, the outcome of this exercise accords reasonably well with the general ideas one has about the structure of an inegalitarian, primary export-oriented Latin American country in a process of severe adjustment. In what follows we discuss only the empirical assumptions or specifications that are likely to be critical for the comparative dynamics properties of the model (for details of the empirical implementation, see Bourguignon 1989).

Table 1 shows the evolution of the stylized economy under our calibration assumptions for the cases of a steady-growth path and an adjustment period following a major shock, assuming redistribution policies are not undertaken. Poor households have been defined as comprising the bottom 40 percent of the income distribution in Venezuela and are assumed to derive almost all their income from raw labor, that is, labor with the lowest skill level. Rich households correspond to the top 10 percent of the distribution and initially own 60 percent of both physical and human capital. The remaining population is "middle class."

As assumed in the theoretical model of section I, gross household income includes all the returns to capital, that is, all profits are distributed. This assumption results in a level of inequality that is higher than is generally observed. The production function is assumed to be Cobb-Douglas in order that the functional distribution of income remain stable over time. Likewise, the savings function, or class-specific savings rates, have been calibrated to yield an approximately constant distribution of income across classes in the steady-growth scenario. In that scenario gross domestic product (GDP) per capita grows at an annual rate of 1.2 percent—for a rate of population growth equal to 3 percent. The adjustment scenario simulation is based on a shock that has progressively reduced GDP and foreign exogenous receipts (F) per capita by 28 percent—the actual drop observed in Venezuela between 1979 and 1985. It also assumes that five years would be sufficient to recover the initial level of GDP per capita if the investment or savings rate were at the level of the steady growth scenario, that is, 26 percent. As shown for the adjustment scenario, however, the calibrated

Table 1. *The Steady-Growth and Adjustment Scenarios without Redistribution Policies*

Model variable by income class[a]	*Steady-growth scenario* Year 1	Year 5	Year 10	*Adjustment scenario* Year 1	Year 5	Year 10
Index of per capita gross income, x_i[b]						
Poor	34.4	36.0	38.3	24.8	29.0	33.4
Middle-income	80.2	83.9	86.2	57.9	65.7	74.1
Rich	447.0	472.5	503.0	322.9	394.4	464.8
Mean per capita GDP[c]	98.6	103.1	108.7	71.2	83.9	96.9
	(100.0)	(104.6)	(110.2)	(72.0)	(85.3)	(98.8)
Index of per capita net income, y_i[b]						
Poor	33.3	34.9	37.1	24.2	28.0	32.1
Middle-income	75.8	78.6	81.9	55.3	62.0	69.6
Rich	379.6	402.3	430.0	281.5	328.9	380.8
Average	98.2	93.5	98.8	65.5	75.0	85.7
Tax rate (percent)[d]						
Poor	3.2	3.2	3.1	2.7	3.5	3.7
Middle-income	5.4	5.2	5.0	4.6	5.7	6.0
Rich	15.1	14.9	14.5	12.8	16.6	18.1
Average	9.5	9.4	9.1	8.1	10.5	11.5
Savings rate (percent)[e]						
Poor	1.7	2.1	2.7	0.4	0.8	1.5
Middle-income	17.3	17.4	17.6	10.1	14.8	15.9
Rich	32.7	32.8	32.9	28.4	32.8	32.8
Average	25.9	26.2	26.6	20.2	24.5	25.0

Note: Values are the numerical solutions to the article's model, assuming that no redistribution policies are in force. The steady-growth scenario assumes steady growth of 1.2 percent per year and per capita. The adjustment scenario assumes that the economy has suffered a shock that has reduced GDP and foreign inflows by 28 percent.

a. Classes are distinguished by their initial holdings of capital, which determine their gross income. Individuals within a class are homogeneous.

b. All income figures are normalized by mean gross income (before correcting for efficiency costs) in year 1 of the steady-growth scenario.

c. Figures in parentheses are mean gross income, before taking account of the efficiency loss of taxation.

d. The tax rate for class i, $i = 1, 2, 3$, is $\tau t(x_i/x)$, where τ is the policy instrument determining the extent of taxation and x is the average per capita gross income for the population. The average tax rate for the population is

$$T = \tau\left[\sum_i n_i x_i t(x_i/x)\right]/x.$$

e. The savings rate for class i, $i = 1, 2, 3$, is $(1 + q)\,s(y_i/y, y_i)$, where y is average per capita net income for the population and q is the ratio of public to private investment. Thus reported rates include private and complementary public savings. The average population savings rate is

$$(1 + q)\left[\sum_i n_i y_i s(y_i/y, y_i)\right]/x.$$

Source: Calculations are based on variables and parameters derived from Venezuelan data in Bourguignon (1989) and estimates from other countries.

recovery is in fact much slower because of an exogenous temporary drop in savings rates associated with the initial crisis.

As noted, the base runs reported in table 1 assume no redistribution is undertaken. Tax receipts, which are slightly more than 9 percent of mean GDP in the steady-growth scenario, finance part of the public investment and current expenditures, which represent 33 percent of private capital accumulation and 15 percent of GDP, respectively. The balance of public expenditure is financed by exogenous foreign receipts—F in equation 12—which, for Venezuela, are assumed to correspond to oil export revenues and to grow at the annual rate of 1.3 percent per capita.

The progressivity of the tax system is summarized by the elasticity parameter b in equation 7. There is little evidence on the value of this parameter in developing countries, as discussed by Morrisson (1980). The value selected for the simulations reported in table 1 leads to a rather progressive tax system in which the average tax rate faced by the rich is almost five times that faced by the poor and three times that of the middle class. (Diaz (1987) reports ratios of 3 and 2, respectively, for Mexico.) Because accurate estimates are not available, however, this is treated as a benchmark value for our later analysis. The case of a proportional tax system is considered in the next section.

Empirical estimates of the cost of taxation are very imprecise. Estimates of the marginal welfare cost of labor income taxation in the United States, derived by Ballard, Shoven, and Whalley (1985), Stuart (1984), and Shoven and Whalley (1984) from applied general equilibrium models, range from 10 to 50 percent of tax revenues. However, using a partial-equilibrium Harberger-type approach, Browning (1987) found that costs ranged from 10 to more than 300 percent of tax revenues. Using developing country data in a general equilibrium framework, Clarete and Whalley (1987) estimate that the marginal cost of a tariff on import substitutes increases from 28 to 600 percent as the tariff rate goes from 5 to 30 percent, whereas the marginal cost of a commodity tax on the same goods varies from −7 to 11 percent. Clarete and Whalley (1987) and Dahl and Mitra (1989) provide similar estimates.

The loss function specified in equation 2 depends on a unique parameter, c. It was arbitrarily chosen to yield a 25 percent marginal loss in the steady-growth simulation if the average tax rate is 10 percent. This average tax rate excludes Venezuela's oil revenue taxes and royalties, which are treated exogenously. The associated average efficiency loss is 16 percent of tax revenues. This seems a reasonable order of magnitude and stands at the lower end of the range of estimates currently found in the literature. The optimal redistribution policy depends on both the marginal cost of taxation and the pace at which it increases with taxation, that is, the convexity of $L(\ )$. With the preceding coefficient, the marginal cost increases from 25 to 43 percent when the average tax rate rises from 10 to 20 percent, whereas the average cost goes from 16 to 25 percent of tax revenues.

III. THE TRADEOFF BETWEEN POVERTY REDUCTION AND GROWTH

This section evaluates the tradeoffs between poverty reduction and efficiency. Because our model postulates that policymakers may choose either income or asset redistribution to reduce poverty, the model is run with alternative values assigned to the two redistribution instruments, Z (income transfers) and H_t (asset transfers), changing the tax rate, T, in each alternative so as to satisfy the government budget constraint. The progressivity of the tax system is that assumed in the base-runs reported in table 1. Transfer targeting to the poor is assumed close to perfect, with only limited leakage to the middle class.

Table 2 shows the effects of net transfers, equivalent to 10 percent of their net base-run income, to the poor in both the steady-growth and adjustment scenarios. The alternatives assume that no transfers (first horizontal block), half (second block), and 100 percent (third block) of all transfers are made in the form of productive assets. The static tradeoff between poverty reduction and efficiency is represented by the results reported for year 1, when all transfers are made in current income. The dynamic tradeoff is shown by the results reported for subsequent years in the same horizontal block. The relative effects of income and asset transfers may then be assessed by comparing the three blocks in the table.

In the steady-growth scenario, both the static and dynamic efficiency costs of increasing the income of the poor appear limited. The instantaneous loss in output (mean gross per capita income) is 0.6 percent and in mean net per capita income is 0.4 percent. Mean net income falls by less than mean gross income because of the way in which the assumptions affect the government budget constraint. The taxes financing redistribution reduce the private savings, and hence investment, rate. The assumption that public investment is complementary to private implies that lower private investment frees government budget resources, which permits higher transfers for a given average tax rate. The overall leakage in the redistribution system is substantial, however. A 10 percent increase in the income of the poor represents 1.2 percent of GDP. But this net transfer requires an increase in the average tax rate equal to 2.3 percent of GDP.

The efficiency cost of poverty reduction increases with time because redistribution has a negative effect on savings. After ten years, however, the loss in output is only 1.7 percent, which is equivalent to approximately a year and a half of growth in the base-run. Of course this loss, as well as those reflecting the static tradeoff, depends heavily on our assumptions about the progressivity of the transfer system and the loss function $L(\ )$. Sensitivity experiments reported in Bourguignon (1989) show that both costs are, not surprisingly, approximately proportional to the marginal cost of taxation; that they would approximately double if transfers were strictly proportional to the transfer index (as in the total absence of targeting when $d = 0$ in equation 7); and that they would increase by 50 percent if the tax rate were constant across classes.

The assumption that redistribution is effected by asset transfers—the last two

blocks in table 2—obviously modifies the time profile of poverty reduction. The poor gain less in the short run. Their income even declines slightly when the entire transfer is in the form of assets because of the assumed complementarity between private and public investment: the complementarity increase in public investment tightens the government budget constraint, thus increasing the taxation borne by the poor. But the poor gain in the long run because of an acceleration in growth. Whether asset transfers are preferable to income transfers of the same amount depends on the time discount rate; when the discount rate is equal to the marginal product of capital, the two types of transfer are equivalent.

Table 2. *The Static and Dynamic Effects of Poverty-Reducing Redistribution Policies on the Model Variables: Per Capita Income, the Taxation Rate, and the Savings Rate*

Proportion of transfer made in productive assets[a]		*Percentage deviations from base runs in:*				
		Steady-growth scenario			*Adjustment scenario*	
(percent)	*Model variable*	*Year 1*[b]	*Year 5*[c]	*Year 10*[c]	*Year 1*[b]	*Year 5*[c]
0	Net income					
	Poor	10.0	10.0	10.0	10.0	10.0
	Middle-income	0.3	0.3	0.4	1.8	−13.0
	Rich	−4.9	−5.9	−7.0	−4.0	−40.2
	Average	−0.4	−1.0	−1.4	0.2	−21.3
	Average output	−0.6	−1.2	−1.7	−0.4	−29.7
	Average tax rate	2.3	1.9	1.7	1.9	5.7
	Average savings rate	−1.9	−1.9	−1.9	−3.7	−16.1
50	Net income					
	Poor	3.9	10.9	16.4	4.1	−2.9
	Middle-income	−1.1	−0.3	0.6	0.0	−20.3
	Rich	−5.5	−7.4	−9.4	−4.2	−43.5
	Average	−2.1	−1.7	−1.4	−1.2	−27.9
	Average output	−0.7	−0.3	−0.2	−0.4	−27.8
	Average tax rate	2.5	2.2	2.0	2.0	7.2
	Average savings rate	2.3	1.1	0.4	−3.2	−10.8
100	Net income					
	Poor	−1.8	11.7	23.5	−1.7	−16.1
	Middle-income	−2.5	−0.8	0.9	−1.8	−28.5
	Rich	−6.1	−8.8	−12.0	−4.4	−46.5
	Average	−3.9	−2.4	−1.4	−3.0	−35.5
	Average output	−0.8	0.6	1.3	−0.6	−27.7
	Average tax rate	2.8	2.6	2.4	2.0	8.5
	Average savings rate	6.9	4.2	2.3	−2.8	−5.6

Note: Results are obtained by simulating the article's model under the alternative assumptions noted and calculating the changes from the base-run solutions. The assumed objective of the redistribution policies is to transfer the equivalent of 10 percent of their net base-run incomes to the poor.

a. Redistribution takes place through the transfer of productive assets or current income or both to the poor.

b. Results for year 1 indicate the static tradeoff between poverty-reducing redistribution and efficiency.

c. Results for years 5 and 10 indicate the dynamic tradeoffs. Year 10 is not reported for the adjustment scenario because in that scenario redistribution becomes infeasible before year 10.

Source: Calculations are based on data from Venezuela in Bourguignon (1989) and, where this is not available, other countries.

Results in the adjustment scenario are dramatically different. Redistribution decreases the mean savings rate, however the transfers are made, and the declines associated with income transfers are substantially greater than in the steady-growth case. This is because the shock-induced recession temporarily increases the income elasticity of savings, as indicated by the function $M(\ )$ in equation 11. Given the huge drop in output resulting from the initial shock (see the adjustment scenario in table 1), the economy is unable to maintain its level of per capita capital. In contrast to the reference simulation in the right-hand side of table 1, structural adjustment does not take place, and the economy enters into a state of decay. A 10 percent increase in the income of the poor becomes more and more costly over time—the tax rate is 5 to 8 percentage points (depending on the proportion of transfers made in assets) higher in year 5 than in the reference simulation—and accelerates the recession by a cumulative process. In fact redistribution is no longer feasible even before year 10—this being the reason that year is not reported on the right-hand side of table 2. Transfers to the poor in the form of assets rather than income slows the recession only marginally.

IV. Exploring the Set of Optimal Redistribution Policies

The simulations reported in table 2 have shown the effects of a poverty reduction policy implemented immediately after an economic shock has made necessary an adjustment process. We now address the question of whether such a rapid response to the increase in poverty is optimal, given the alternative parameter values of the social objective function.

Optimal redistribution policies are shown in table 3 for the steady-growth and, with more detail, the adjustment scenarios. In the first instance, it proves optimal to redistribute quite a significant share of GDP at the beginning of the period, even though the social welfare function's inequality aversion parameter ϵ (see equation 14) is moderate.

Given the distribution of income, an ϵ value of 1.2 means that policymakers would be willing to sacrifice 25 percent of total output to achieve perfect equality. The total net transfer to the poor is initially 60 percent of their income, approximately 7 percent of GDP, and this requires an increase of approximately 10 percent in the mean tax rate. More than half of that transfer is initially made in the form of assets, but this proportion rises very quickly over time. By year 10 the entire transfer is in the form of assets. At the same time the growing equality of gross income that results from asset accumulation in the poor makes transfers less and less desirable, so that there is a steady decline in the rate of transfer. Furthermore, redistribution increases the poor's propensity to save, which permits faster overall capital accumulation, which, in turn, fosters growth. As a result the efficiency loss in output resulting from the initial redistribution is fully compensated around year 10.

Of course, the optimal redistribution policy depends directly on the parame-

ters of the social welfare function. With low inequality aversion, ϵ, or a low time discount rate, θ, no redistribution takes place. For higher values, some redistribution is undertaken but by the least costly method in terms of growth, that is, through asset transfers. Redistribution through both current income and productive assets transfers is only effected above some critical values of ϵ and θ, and it would take extreme values of both parameters for redistribution to be made in current income alone. More generally, it may be shown that transfers of productive assets are preferred to transfers of current income along a steady-growth path if $r > \theta + \epsilon g$, where r is the rate of return on assets and g the rate of growth of the economy.

As before, results are dramatically different in the adjustment scenario. The second and third blocks of table 3 show the optimal redistribution policy for two values of the inequality aversion parameter, ϵ, when no foreign borrowing is allowed—foreign inflows, F, grow at the constant rate of the reference adjustment scenario in table 1. Even when equality is most highly valued ($\epsilon = 2.2$), it does not prove optimal to alleviate poverty during the first three years of the adjustment period. Some redistribution does take place in years 2 and 3, but it is in favor of the rich or middle class and corresponds to a forced savings policy by the government. Despite efficiency losses the government fosters adjustment and growth by increasing the taxes paid by the whole population and transferring the proceeds to the rich of the middle class—who will save more of the returns than the poor—in the form of productive assets. In this process not only do the poor receive nothing, but their net income falls because of the additional taxes they pay and the corresponding efficiency losses. The poverty reduction policy becomes optimal only when the economy starts to recover in year 4. As discussed above, transfers are all in the form of productive assets at the lowest value of ϵ, and predominantly in current income at the highest value, but take place only when the economic recovery is sufficiently advanced.

Optimality is not achieved in redistributing to the poor, either in current income or in productive assets, during the first three years of adjustment because of the very large opportunity cost of investment during those years. Under these conditions any weakening of the foreign financing constraint would be expected to drastically modify the optimal redistribution policy. The last block of table 3 shows the optimal policy for the lowest value of the inequality aversion parameter, when the economy receives a foreign loan of 7 percent of GDP in year 1. This is amortized during the ten years considered at a 10 percent rate of interest. In contrast to the preceding experiment the exogenous variable F is increased in year 1 and reduced in the nine subsequent years. As expected, redistribution in favor of the poor becomes optimal right at the beginning of the adjustment period, although the loan is not sufficiently large to prevent the forced savings phenomena observed above.

The preceding results must be treated with some care, however. Without an upper-bound on the rate of investment, the optimal policy results in an almost immediate and complete recovery of GDP to its pre-shock level, a rather unlikely

Table 3. *Transfer Choice and Output Change under Optimal Redistribution Policies in the Steady-Growth and Adjustment Scenarios*

Transfers[a] *and output by scenario*	Year 1	2	3	4	5	6	7	8	9	10
Steady-growth scenario										
Inequality aversion, ε = 1.2										
Total transfer to the poor	59.0	48.0	39.1	32.0	25.8	21.1	17.2	14.3	12.2	10.5
of which: current income	23.1	15.2	9.2	4.6	1.2	—	—	—	—	—
Transfer to the middle class	4.7	3.5	2.4	1.4	0.4	—	—	—	—	—
Transfer to the rich	—	—	—	—	—	—	—	—	—	—
Output[b]	95.0 (−3.7)	96.6 (−3.1)	98.3 (−2.5)	100.0 (−2.0)	101.7 (−1.4)	103.3 (−0.9)	104.8 (−0.6)	106.2 (−0.3)	107.5 (−0.1)	108.7 (0.0)
Adjustment scenario without foreign borrowing										
Inequality aversion, ε = 1.2										
Total transfer to the poor	—	—	—	39.1	48.7	42.7	32.2	25.5	20.8	17.7
of which: current income	—	—	—	—	—	—	—	—	—	—
Transfer to the middle class	—	—	2.2[c]	—	—	—	—	—	—	—
Transfer to the rich	—	3.0[c]	—	—	—	—	—	—	—	—
Output[b]	71.2 (0.0)	71.4 (0.0)	73.6 (−0.7)	78.1 (−0.9)	83.4 (−0.6)	88.6 (0.2)	92.3 (0.5)	94.6 (0.5)	96.1 (0.4)	97.3 (0.4)

Inequality aversion, ϵ = 2.2										
Total transfer to the poor	—	—	—	34.9	43.5	46.3	46.2	44.9	46.0	45.0
of which: current income	—	—	—	8.9	18.6	26.8	34.1	40.4	39.6	37.5
Transfer to the middle class	—	—	6.0[c]	2.4	5.2	7.8	10.4	12.8	12.9	12.5
Transfer to the rich	—	—	—	—	—	—	—	—	—	—
Output[b]	71.2	71.4	73.6	78.1	82.2	84.9	86.6	87.4	87.7	88.2
	(0.0)	(0.0)	(−0.7)	(−0.9)	(−2.0)	(−4.0)	(−5.7)	(−7.1)	(−8.4)	(−9.0)
Adjustment scenario with foreign borrowing in Year 1										
Inequality aversion, ϵ = 1.2										
Total transfer to the poor	67.5	32.0	29.6	23.9	19.5	16.2	13.5	11.3	9.3	12.1
of which: current income	—	—	—	—	—	—	—	—	—	—
Transfer to the middle class	—	—	—	—	—	—	—	—	—	—
Transfer to the rich	10.9[c]	—	—	—	—	—	—	—	—	—
Output[b]	71.5	93.6	95.7	97.3	98.4	99.2	99.8	100.4	100.9	101.4
	(0.4)	(31.1)	(29.1)	(23.5)	(17.3)	(12.2)	(8.7)	(6.7)	(5.4)	(4.6)

—Not available.

Note: Optimal redistribution policies maximize a social welfare function with inequality aversion parameter, ϵ.

a. Transfers, in net terms, are expressed as a percentage of gross income.

b. Figures in parentheses are percentage deviations from the no-redistribution case (table 1).

c. Transfer, or part of it, is in productive assets.

scenario. The optimal policy when there is a limit on the rate of investment i not clear. The country could spend the foreign loan over a longer period, whic would permit a reduction in taxes. It could also use a part of the loan to financ current income transfers, thus reducing poverty.

V. Conclusion

The applied framework developed here has proven a useful tool for evaluatin the efficiency cost of poverty-reducing redistribution policies. Under what seer to be reasonable assumptions for a few key parameters—essentially the prog ressivity of the transfer system and its marginal efficiency costs—it has bee shown that, in an economy on a steady-growth path, poverty can be substan tially reduced at a rather low efficiency cost.

The optimal policy is quite different when the economy has suffered a stron adverse shock and is entering an adjustment period during which the margina productivity of capital is temporarily much higher. Under the same set of as sumptions, immediate redistribution (before the adjustment process has reall started) would be optimal only in a society with an almost infinite aversion t inequality and, presumably, in which the initial level of poverty would not be a high as the one postulated in our numerical experiment. For less egalitaria policymakers, redistribution becomes desirable only after some adjustment ha been achieved, possibly through the forced savings of the rich and the middl class. Depending on the initial conditions (the size of the shock) and on the spee of adjustment, the possibilities for early redistribution may be quite limited.

The scope for poverty-reducing redistribution depends on the size of feasibl net transfers. How large a net transfer is feasible depends crucially, in ou framework, on three factors: the transfer progressivity parameters, the effi ciency loss parameters, and the true marginal productivity of savings and invest ment. Estimates of these parameters are required for a sensible decision abou redistribution. Some countries have information on the progressivity of th transfer system, but very little is known about the actual efficiency costs of taxe and benefits. Because taxation reforms are being discussed or implemented i many developing countries, high research priority should be given to analyzin these costs. Similarly, more investigation of the marginal productivity of capita during periods of economic adjustment is needed. There is a prolific literatur on the short-run management of the standard macroeconomic instruments, bu little has been written on the medium-term capital requirements of effectiv structural adjustment.

Finally, the role played by our assumed foreign financing constraint must b stressed. It is only optimal to limit redistribution during major structural adjust ment because our framework does not allow the economy to arbitrage intertem porally. Given the higher productivity of capital during the adjustment period, i would be beneficial to borrow abroad at a rate of interest proportionately highe than the long-run rate of return to capital. It has been shown here that part o

he loan could optimally be used, directly or indirectly, for a fast and significant 'eduction in poverty, without impairing the adjustment potential of the :conomy.

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Distributional Effects of Adjustment Policies: Simulations for Archetype Economies in Africa and Latin America

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For developing countries the 1980s was a decade of external shocks whose adverse effects were compounded by domestic macroeconomic imbalances and structural inefficiencies. The performance of developing countries during this decade, however, was not uniform. The effects of terms of trade and interest rate shocks are simulated for two model economies, one representing an average Latin American economy and the other representing an average African economy. In addition to the effects of the shocks, the effects of different adjustment policies are examined. As expected, identical shocks and adjustment packages yield different outcomes for growth, poverty, and income distribution in the two economies. The differences in results can be traced to specific features of the models, and, to the extent that the archetypes created are representative of real economies, have implications for adjustment policy prescriptions.

It has long been recognized that so long as basic social services are provided to the poor, economic growth remains the primary means of reducing poverty and improving the quality of life. When growth slows markedly, however, as it did during the 1980s, the focus shifts toward the role of public policy in reducing poverty. Confronted with the macroeconomic crises of the 1980s, policies to alleviate poverty become more difficult to design because of the need to both stabilize the economy and promote restructuring so as to ensure long-term growth. The interaction of initial macroeconomic conditions and economic structure with stabilization and structural adjustment policies (or lack thereof) explains the divergent growth and distribution performance across countries during the past decade.

To recount briefly, the 1980s will be remembered as a decade of external shocks for developing countries. Weak demand from developed countries, declining terms of trade (prices for many primary commodities fell to their lowest

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levels since World War II), a diminishing supply of external finance, and an increase in the level and volatility of interest rates combined to produce an unusually unfavorable external environment. For many countries the need to adjust was also compounded by macroeconomic imbalances resulting from overly expansionary fiscal policies made possible by external borrowing before the crisis.

For all countries, a reduction in absorption was required to adjust to the terms of trade and interest rate shocks. But in countries where initial conditions were relatively favorable because of manageable macroeconomic imbalances and relatively little need to restructure, adjustment was accompanied by an acceleration of growth and an alleviation (or containment) of poverty. This was largely the case for East and South Asian countries, whose average real gross domestic product (GDP) per capita grew 1.5 to 2.0 percentage points faster per year during 1980–89 than during 1973–80.

In Sub-Saharan Africa and in Latin America and the Caribbean, initial macroeconomic imbalances were large or the need for structural adjustment was greater because of many years under heavily distorted incentive systems. Implementing the right policies was also often harder because of structural rigidities caused by weak institutions (Sub-Saharan Africa) or by distributional conflicts (Latin America and the Caribbean). The outcome was an average annual per capita GDP growth of −2.2 percent in Sub-Saharan Africa and −0.6 percent in Latin America and the Caribbean during the 1980s. For Sub-Saharan Africa per capita GDP growth during 1973–80 had been barely positive, but for Latin America and the Caribbean average per capita GDP growth had been 2.6 percent. It is, therefore, no surprise that the past decade has been called a lost decade for the poor in these regions. The *World Development Report 1990* (World Bank 1990) estimates that in 1985, 30 percent of the population in Africa and 12 percent in Latin America was in extreme poverty.

The strikingly different performance between the East and South Asian countries, on the one hand, and the African and Latin American and Caribbean countries, on the other, raises several issues. Was the difference mostly attributable to market characteristics (flexible versus nonflexible economies), levels of development (middle-to-high income versus low income), institutional development (economies financially developed and integrated into the world financial markets versus financially underdeveloped economies)? It would be useful to investigate how important these various differences are in practice. In particular how will growth and income distribution respond to similar (or identical) policies in these different economic environments? Is it likely that poverty and income distribution indicators will react in the same way in the African and Latin American economies?

This article is concerned with the interaction of "typical" stabilization and structural adjustment policies on income distribution in what we shall refer to as "typical" Latin American and African economies. This label is, of course, only suggestive, and one could just as well think of our archetypes as representative of low-income and middle-income economies or of flexible and rigid economies.

Because of stylized differences between the two archetype economies, the same packages or shocks can be expected to have different distributional effects in spite of the same classifications of sectors and socioeconomic groups.

To anticipate what is described in greater detail in the body of the article, we build two archetypical economies to which we apply the same external shock that will result in different effects because of different structures and initial conditions. The first typical adjustment package is arrived at by roughly calibrating the model to produce changes in average values of key macroeconomic variables like growth, external debt, and investment rates that were observed between 1979–81 and 1986–89. The result of this rough calibration exercise is labeled the *standard* (or average) adjustment package. It includes countries that implemented stabilization and adjustment policies advocated by the World Bank and International Monetary Fund (IMF) as well as countries that did not or that did so only intermittently. To keep things simple and to identify more clearly the effects of structural differences across archetypes, we identify the standard adjustment package with exchange rate adjustments. We first analyze in some detail the macroeconomic and distributional effects of this standard adjustment pattern with the alternative scenario of a no-shock growth path.

We then compare this standard adjustment package with three other typical packages. The rationing adjustment package can be characterized by the failure to reduce imbalances and alter economic structures by changing policy incentives. In our framework this amounts to resisting real exchange rate depreciation. The structural reform package corresponds to adjustment packages supported by the World Bank and the IMF. In that typical package, rationalization of trade and fiscal incentives is intended to help reduce the fiscal imbalance and restructure the economy. Finally, the redistribution package combines the reforms of the previous package with redistributive measures along the lines advocated in recent studies on poverty alleviation. One can think of this package as approximating the strategy advocated in the *World Development Report 1990.*

The remainder of the article is organized as follows. In the following section, we describe in some detail the main features of the simulation model, including the differences in model closures between the two archetype economies with respect to the functioning of labor, goods, and foreign exchange markets. Calibration to initial macroeconomic conditions in the early 1980s is then described, along with an analysis of the effects of the shock under the standard adjustment scenario. We compare adjustment under the standard package with adjustment under the three other typical packages described above, and then draw our conclusions.

I. Model Outline

The model is designed to capture the short- and medium- to long-run effects of stabilization and structural adjustment policies on the distribution of income. It is fully described in Bourguignon, Branson, and de Melo (forthcoming) and is available upon request. We refer to the model as a "maquette" because of the

variety of closures afforded by the "micro-macro" linkages built into it. Micro-linkages come from the interactions across the six sectors included in the model. These long-run linkages are well known from the literature on computable general equilibrium (CGE) models and are not discussed here. Macro-linkages come from the standard IS-LM macro framework for an open economy (see Tobin 1969). These linkages are not discussed either, although they will become apparent from the description of the differences in our modeling of the labor, goods, and financial markets in the two archetype economies.

The construction of the archetypes draws on the work of Chenery and his colleagues (Chenery and Syrquin 1975 and Chenery, Robinson, and Syrquin 1987) and is detailed in the appendix. Archetypical economies have the same disaggregation across labor markets, goods markets, and socioeconomic groups, but, to reflect differences in their levels of development and economic structures, the relative importance of sectors, labor markets, and socioeconomic groups differ. For example, the agricultural labor market is more important in the African archetype economy than in the Latin American one. Initial conditions such as the size of the external debt and the rate of interest on the external debt also differ. Further, demand and supply elasticities are usually lower in the African than in the Latin American archetype, and, most important, the functioning of labor, goods, and financial markets differs between the two archetype economies.

In both archetype economies we distinguish five financial units: government, households, firms, the consolidated banking system, and the foreign sector. By assumption, governments do not lend, households do not borrow, and, because of thin (or nonexistent) equity markets in most developing countries, the equity market is modeled rudimentarily so that the endogenously determined proportion of household savings allocated to equity is made directly available to firms.

The different modeling assumptions are summarized in table 1. In the African archetype there is no market for government debt, the government holds all foreign debt, and household financial wealth is made up entirely of domestic financial assets (money and equity). By contrast, in the more developed financial markets of the Latin American archetype, part of the government debt is held in domestic bonds, households hold foreign assets, and firms have part of their debt in foreign currency.

Because it is difficult to sterilize capital flows in Latin American economies with relatively integrated financial markets, it is assumed that monetary authorities can only partially control the money supply in the Latin American archetype. The change in base money, H, is given by:

$$\Delta H = \Delta L_b - e\theta KA_p + \Delta B_b$$

where L_b is the liability of the banking system, e is the exchange rate (units of domestic currency per unit of foreign currency), KA_p is the private capital account, B_b is government issued domestic debt, and θ $(0 < \theta < 1)$ measures the

Table 1. *Assumptions of the Model*

African archetype	*Latin American archetype*
Financial sector	
• Money supply exogenous ($\theta = 0$)[a]	• Money supply partly endogenous ($\theta = 0.3$)[a]
• No bond market; government holds only foreign debt (B^*_w)	• Bond market; government holds domestic debt (B_b) and foreign debt (B^*_w)
• Households hold cash (H_h) and equities in firms ($p_a E$)	• Households hold cash and foreign bonds (F^*_h) in their portfolio as well as equities in firms ($p_a E$)
• Firms use working capital (H_f) and liabilities of the banking system (L_b)	• Firms use working capital (H_f), liabilities of the banking system (L_b), and foreign-denominated debt (L^*_w)
Foreign exchange market	
• Limit on government borrowing (B^*_w); firms and households have no access to the foreign capital market	• Limit on government borrowing (B^*_w) and on firm borrowing (L^*_w), but no limit on foreign assets held by households (foreign and domestic assets are imperfect substitutes)
Labor market	
• Flexible wages for agricultural labor; downward nominal rigidity for modern sector labor	• Flexible wages for agricultural labor: full indexation on cost of living (full real wage rigidity) for modern sector labor
Goods market	
• Flexible prices for all sectors	• Mark-up pricing in modern sector; flexible prices in other sectors

a. θ is the monetized proportion of private capital movements.

degree of sterilization of foreign capital flows. Also, because of the evidence that inflation leads to flight from money, households' real demand for money, H_h, is

$$H_h = H_h(\underset{+}{y}, \underset{-}{i}, \underset{-}{\dot{p}^e}) \tag{1}$$

where signs under the variables indicate the signs of the corresponding partial derivatives, y is real income, i is the nominal interest rate, and $\dot{p}^e$ is the exogenously given expected inflation rate.

In the foreign exchange market with a normal external environment, that is, without shock, there is no constraint on foreign borrowing. The exchange rate is then predetermined, and endogenous government borrowing ΔB^*_w is given by:

$$-\Delta B^*_w = CA(\underset{-}{i}, \underset{+}{e}) + KA_p(\underset{+}{i}, \underset{-}{e}) \tag{2}$$

where CA is the interest inclusive current account and, for the Latin America archetype, $KA_p = \Delta L^*_w(\underset{+}{i}, \underset{-}{e}) - \Delta F^*_h(\underset{-}{i}, \underset{+}{e})$, where L^*_w is firm borrowing from abroad, and F^*_h is households' holdings of foreign bonds. For a given domestic price, the current account responds positively to the exchange rate and negatively to the interest rate because of investment demand. For given expectations private firms (households) shift toward domestic debt (foreign assets) when the

exchange rate devalues (revalues) and when the interest rate rises (falls). In the African archetype the capital account is exogenous by assumption. In all simulations, except the no-shock scenario, it is assumed that each archetype faces an exogenously determined foreign exchange constraint and the government borrows an exogenously set amount ΔB_w^*. Money is the only financial asset held in the African archetype, so that when the amount of foreign borrowing is fixed, the fiscal deficit is financed from seignorage on the cash holdings of firms and households. In the Latin American archetype big farmers and capitalists hold a fraction of their financial portfolio in foreign assets and domestic bonds. The fiscal deficit is therefore also partly financed from domestic borrowing. Also, in the Latin American economy not only does the government face a foreign borrowing constraint, but firms can no longer borrow abroad, that is, $\Delta L_w^* = 0$. Households, however, continue to hold foreign bonds in their portfolios even when there is foreign exchange rationing. In addition we assume that foreign exchange controls are ineffective in the Latin American archetype, so that we are able to capture the widely documented phenomenon of capital flight. Thus, although foreign borrowing is constrained in both economies, households can shift their portfolios toward foreign-denominated assets in the Latin American archetype in response to changes in the domestic economic environment.

In both archetypes the economy is divided into six sectors—primary export, agriculture, nontraded informal (private services and cottage shop activities), consumer goods, intermediate and capital goods, and nontraded formal (construction and utilities)—and six socioeconomic groups—two capitalist groups (large farmers and modern-sector capitalists), small farmers, and three worker groups. The primary export sector is the standard export sector (a mineral or cash crop sector), whereas agriculture includes activities that compete with imported agricultural products. In both archetypes after-tax profits are largely distributed to the capitalist socioeconomic groups, whereas worker income comes primarily or exclusively from the sale of labor services. The appendix describes in more detail the output and final demand structures, taxes, the mapping of factor incomes into socioeconomic groups, and the holding of financial assets.

In the labor markets agricultural workers are assumed to be paid a competitive wage, and informal workers earn their average product. In the African archetype modern sector wages are downwardly rigid in nominal terms, but there is usually enough inflation to clear the modern labor market. In the Latin American archetype wages for modern sector workers are fully indexed to the cost of living. This reflects the combination of union power and workers' resistance to a cut in living standards. With real wage rigidity any disequilibrium in the modern labor market resulting in an excess supply of labor results in unemployment.

In the goods markets we assume that prices adjust to clear markets in the African archetype. In the Latin American archetype we assume that capitalists in

the modern sector will resist cuts in their profit rates. This implies a mark-up pricing rule of the type:

$$p^{v} = w_{-1}(1 + m)(1 + \alpha \hat{p}^{e}) \tag{3}$$

where p^v is the value added price, w_{-1} is last period's labor cost per unit of output, m is the mark-up rate, and $\alpha < 1$ depends on how much resistance there is to a cut in profits. In the modern sector, the rate of capacity utilization U is adjusted to clear the market in case of excess supply. Hence supply is given by $q^s = UF(\bar{K}, L)$, where $\bar{K}$ is the fixed capital stock, L stands for labor, and $F(\ )$ is the sectoral production function. Thus in the Latin American archetype the combination of wage indexation with a mark-up pricing rule leads to an extremely rigid modern sector.

The government sector is modeled identically in both archetypes. The government collects taxes on domestic and imported goods and pays interest on internal and external debt. Noninterest government expenditures are divided into three components: wages, consumption expenditures, and investment expenditures. Government workers, whose employment level is exogenous, receive an exogenous wage. To simplify the interpretation of results, we assume that the marginal productivity of government investment is the same as for private investment. We also assume that all components of noninterest expenditures grow at 3 percent per period in all simulations. Thus we abstract from any productivity effects that would arise from changes in patterns of government expenditures. However, for a given monetary and exchange rate policy, any change in the fiscal deficit has an effect on private investment demand by clearing the money market.

The immediate effect of the external shock considered here is to require a reduction in absorption relative to income. There is no room to increase supply since the economies are initially assumed to be at a full-employment equilibrium. With more rigidity in goods and labor markets in the Latin American archetype, the shock moves the economy inside its production possibility frontier, and the reduction in absorption is greater than in the more flexible African archetype. Of course resources are not actually fully and efficiently employed in the no-shock scenario, and structural adjustment policies were intended to move economies closer to their production frontier. We do not model directly this supply-augmenting effect, which structural adjustment policies were presumed to have, because of the lack of reliable information on the extent of resource idleness caused by inappropriate incentives. Rather we implicitly assume that in the no-shock scenario economies would have had sufficient access to external funding to have normal capacity use. In particular we do not take into account the possibility of immiserizing capital inflows caused by distortions (see Brecher and Diaz-Alejandro 1977).

In the longer run there is also an effect of adjustment on growth resulting from changes in the composition of absorption. Household savings of capitalists are

negatively affected by the incorporation of a wealth effect in the consumption function, and, for a given amount of savings, the allocation of savings to physical capital depends on the relative price of equities (that is, of physical capital) compared with other financial assets.

The other component of absorption is private investment. How it reacts to changes in the endogenously determined macroeconomic variables will largely determine the relative success of stabilization and structural adjustment policies. Investment demand by the private sector I_p is given by:

$$I_p = I_p\left(\frac{U(p^v \partial F / \partial K)/p_k}{(i_r - \dot{p}^e)}\right). \tag{4}$$

Investment demand is a positive function of capacity utilization and that sector's marginal revenue product of capital $p^v\ \partial F/\partial K$ and a negative function of the cost of capital p_k and the opportunity cost of borrowing $i_r - \dot{p}^e$, where i_r is a weighted sum of domestic and foreign interest rates adjusted for exchange rate changes. In turn the price of capital goods and the opportunity cost of borrowing is affected by the value of the real exchange rate.

How adjustment affects income distribution among socioeconomic groups is influenced by three factors. First is the standard effect coming from the mapping of factor incomes into socioeconomic groups. Incomes of factors employed relatively intensively in expanding sectors will rise. Likewise rents will rise in sectors that expand, with the real income of immobile factors changing more than those of mobile factors. Second, poor socioeconomic groups, which have consumption patterns that are not price responsive—because they are concentrated in necessities with low price (and income) elasticities of demand—will be more severely affected by changes in relative prices and real income. Third, poor socioeconomic groups, which have little equity and hold financial assets mostly in the form of noninterest-bearing money, will lose more from shocks that raise the inflation rate and lead to a real exchange rate depreciation. However, rich socioeconomic groups, which have more diversified portfolios and hold interest-bearing assets or assets denominated in foreign currency, are better protected against inflation and capital losses.

II. Adjustment to an External Shock in the Two Archetype Economies

We now turn to an analysis of how interest rate and terms-of-trade shocks affect macroeconomic and distributional indicators in the two archetype economies. The terms-of-trade shock is a 20 percent increase in the foreign currency price of imports (p_m^*) in period 2 only. The interest rate shock is a permanent doubling of the interest rate (i^*) on foreign debt beginning in period 2 (simulations run for seven periods). Because the typical African economy holds publicly guaranteed debt disbursed under donor assistance, it has a relatively high grant element compared with the stock of external debt held by the typical Latin American country, where the proportion of commercial debt with a variable

interest rate is high. Hence the interest rate on foreign debt in the African archetype is doubled from 4 to 8 percent per year, whereas for the Latin American archetype the interest rate is doubled from 8 to 16 percent.

Assuming that the parametrization of the external shock is sensible, the plausibility of the archetypes and of the differing assumptions about market behavior, parameters, and initial conditions can be judged by comparing model outcomes with realized values of macroeconomic variables averaged over African and Latin American economies during 1979–86. We assume that if the external environment in the 1980s had been benign, average performance achieved during 1978–81 would have continued throughout the 1980s. We compare these average realized values for 1978–81 with period 1 values obtained with the simulation model, which indicate macroeconomic outcomes for most flow indicators over the entire simulation in the absence of an external shock. The realized average values of variables during 1986–89 are taken to represent the combination of the unfavorable environment resulting from the external shock and the standard adjustment to that shock. They are compared with model results from period 7 after the economies have settled down from the effects of the shock and of the standard adjustment package.

The realized values of macroeconomic indicators and the values generated by the model under the standard adjustment package are compared in tables 2 and 3. Looking at the realized values, four stylized outcomes stand out. First, growth slowed much more in Latin America than in Africa. But the larger population growth rate in Africa (3.2 percent per year versus 2.2 percent for Latin America) resulted in declining average per capita income in Africa. Second, the investment share in GDP fell drastically in both regions. Although some portion of the fall in investment rates was certainly compensated for by increases in the marginal efficiency of investment, it is implausible that efficiency gains compensated for the loss in investment volume. Third, the current account deficit worsened slightly for both regions because of the surge in interest payments on the external debt in spite of the sharp real exchange rate devaluation. Fourth, inflation skyrocketed in Latin America, whereas it remained stable in Africa in great part because of the influence of countries in the franc zone.

The model results broadly replicate these stylized outcomes, although there are some discrepancies. For the Latin American archetype the treatment of rigidities in the model magnifies the fall in growth rates when compared with the average realized values. Regarding inflation, in the Latin American archetype the exogenous treatment of expectations about inflation and devaluation in the simulations makes any outcome possible. In view of the very uneven inflation patterns both within and across countries, we have assumed "strong" inflationary expectations only during the period when the shock occurs. As a result an inflation bout occurs in period 2, and the economy settles back to a "normal" inflation pattern thereafter. Hence we are not modeling the dynamics of hyperinflation. With respect to the real exchange rate index, the two indicators are not strictly comparable, since the index calculated from the model corresponds

Table 2. *GDP Growth and Inflation: Africa and Latin America, 1978–81 and 1986–89*
(annual average in percent)

Indicator	*Africa*				*Latin America*			
	Actual value		*Value generated by the model*		*Actual value*		*Value generated by the model*	
	1978–81	*1986–89*	*Without shock*	*With shock*	*1978–81*	*1986–89*	*Without shock*	*With shock*
GDP growth per year	2.9	2.8	3.0	2.6	3.7	2.4	4.4	1.1
Inflation rate per year (CPI)	20.9	22.1	16.4	18.3	21.1	271.3	30.5	37.5

Note: Actual values are unweighted averages for the periods indicated. The values generated by the model are compounded seven-year average annual growth rates for the no-shock and shock simulations.
Source: World Bank data and authors' calculations.

Table 3. *Macroeconomic Indicators: Africa and Latin America, 1978–81 and 1986–89*
(percent unless otherwise indicated)

Indicator	*Africa*				*Latin America*			
	Actual value		*Value generated by the model*		*Actual value*		*Value generated by the model*	
	1978–81	*1986–89*	*Period 1*	*Period 7*	*1978–81*	*1986–89*	*Period 1*	*Period 7*
Investment/GDP	22.70	18.10	21.60	15.50	22.30	17.30	22.60	14.80
Current account/GDP	−4.80	−5.90	−4.60	−5.40	−4.60	−5.20	−3.30	−7.40
External debt/exports	0.89	3.59	1.07	1.89	1.16	3.35	0.99	2.89
Interest payments/exports	3.40	11.10	3.70	15.10	9.90	24.30	9.50	42.50
Real exchange rate (1980=1)	1.02	1.46	1.00	1.09	1.01	1.14	1.00	1.08

.o the relative price of tradables, whereas the calculated value for regional ıverages corresponds to an index of external competitiveness rather than to an ndex of resource allocation within the economy. Because the model was de-ıigned for counterfactual analysis and not forecasting, one should not require :xact replication of realized values. The comparisons indicate, however, that the nain changes observed during the 1980s are captured by the standard adjust-nent package built into the model.

We now evaluate the effects of the external shock on income distribution ınder the standard adjustment package. In the favorable external environment ›ase simulation, expectations are realized. The money supply, inflation, and :xpected devaluation (and actual devaluation) all grow at 30 percent per period 'or the Latin American base simulation and 15 percent for the African base ›imulation (except for the money supply in Africa, which grows at 20 percent ›er period). Under this scenario there is no foreign borrowing constraint, real :xchange rates and real interest rates are nearly constant, and there is full :mployment of labor and full capacity use. As shown in table 4, the debt-to-:xport ratio doubles by the end of the seven-period simulation, with the fiscal leficit worsening in Africa mainly because of the rising external debt service. The value of exports grows less rapidly in Africa than in Latin America because ›f a bias toward primary products with low price and income elasticities of lemand. This difference reflects the difficulties that African countries have had n expanding export earnings.

Because of higher population growth, the normal external environment for he African archetype is just sufficient to maintain poverty indicators constant hroughout the simulation, although the distribution of income becomes signifi-:antly more equal according to the Theil index of inequality. However, the :ombination of higher GDP growth and lower population growth enables the .atin American archetype to achieve a reduction in poverty and a marginally nore equal income distribution.

In the simulations with the unfavorable external environment, in which the nterest rate on external debt is doubled for periods 2 to 7 and the foreign :urrency price of imports is hiked by 20 percent in period 2, the standard ıdjustment package is derived as follows. In the African archetype a limit on :xternal borrowing is imposed with no changes in expectations or monetary ›olicy. In the Latin American archetype the limit on public borrowing is comple-nented by a freeze on the portfolio choice of firms that see their foreign-lenominated debt frozen to its period 2 value. No constraints are imposed on ›ortfolio choices by households. Because of the rigidities built into this arche-ype, expectations of inflation and the rate of devaluation are raised to 35 ›ercent in period 2 and 40 percent in period 3, with a corresponding increase in he money supply. For subsequent periods expectations and monetary growth 'esume preshock values. To simplify this adjustment package we have assumed ıo contractionary change in fiscal (or monetary) policy as a result of the shock. .n other words we assume that the limit on foreign borrowing is met by varia-

Table 4. *Macroeconomic and Distributional Indicators for the Two Archetypes with and without Shock*
(percent unless otherwise indicated)

	African archetype				*Latin American archetype*			
	Without shock		*With shock*		*Without shock*		*With shock*	
Indicator	*Period 2*	*Period 7*	*Period 2*	*Period 7*	*Period 2*	*Period 7*	*Period 2*	*Period 7*
GDP (period 1 = 100)	103.0	120.0	103.0	117.0	104.0	129.0	101.0	107.0
Export value (in foreign currency units)	21.6	23.6	23.8	28.9	17.1	21.5	19.7	21.2
Investment/GDP (real)	21.5	20.5	18.9	15.5	21.4	23.6	13.8	14.8
Inflation rate (CPI)	16.8	16.9	20.7	18.1	35.4	30.0	108.3	30.0
Devaluation rate	15.0	15.0	27.0	17.6	30.0	30.2	108.0	31.4
Interest rate	20.1	21.2	20.3	23.4	35.9	34.1	49.0	42.1
Overall deficit/GDP	4.0	6.2	5.2	9.0	6.2	6.7	8.2	17.4
Primary deficit/GDP[a]	3.1	4.6	3.2	5.2	3.9	3.0	4.4	5.8
Debt/exports[b]	113.0	239.0	103.0	189.0	124.0	224.0	107.0	289.0
Debt service/exports[b]	4.5	9.3	8.3	15.1	11.3	21.0	17.2	46.2
Domestic debt/GDP	n.a.	n.a.	n.a.	n.a.	3.4	4.0	5.8	7.0
Domestic debt service/government revenue	n.a.	n.a.	n.a.	n.a.	7.1	9.0	4.7	18.0
Household foreign assets/exports	n.a.	n.a.	n.a.	n.a.	34.4	42.0	48.2	57.2
Theil index[c]	66.4	58.6	61.5	50.8	37.1	35.0	33.4	43.2
Poverty gap[d]	2.68	2.71	2.77	2.71	0.84	0.63	0.91	1.49
Poverty rate	30.4	31.1	29.9	29.5	11.8	10.5	12.1	19.5

n.a. Not available.
a. Does not include interest payments on public debt.
b. Public and private external debt.
c. A decrease in the value of the index indicates less income inequality.
d. The poverty gap indicates the percentage of income that must be redistributed to bring all those below the poverty line up to the poverty line.
Source: Authors' calculations.

tions in the exchange rate alone. This clearly overstates the laxity of fiscal policies pursued in a standard adjustment package, but it makes it easier to interpret the effects of differences in economic structure, initial conditions, and market mechanisms on adjustment policies.

The impact of the shock and the standard adjustment on macroeconomic variables in periods 2 and 7 is given in table 4. Private investment declines sharply in both economies (public investment grows exogenously), because of the combined effects of a higher price for imported capital goods (resulting from the devaluation of the real exchange rate) and a higher real interest rate (resulting from larger government borrowing from the Central Bank to finance interest payments). This effect is particularly strong for the Latin American archetype and is certainly in accord with the sharp rise in real interest rates that occurred during the past decade in many Latin American economies.

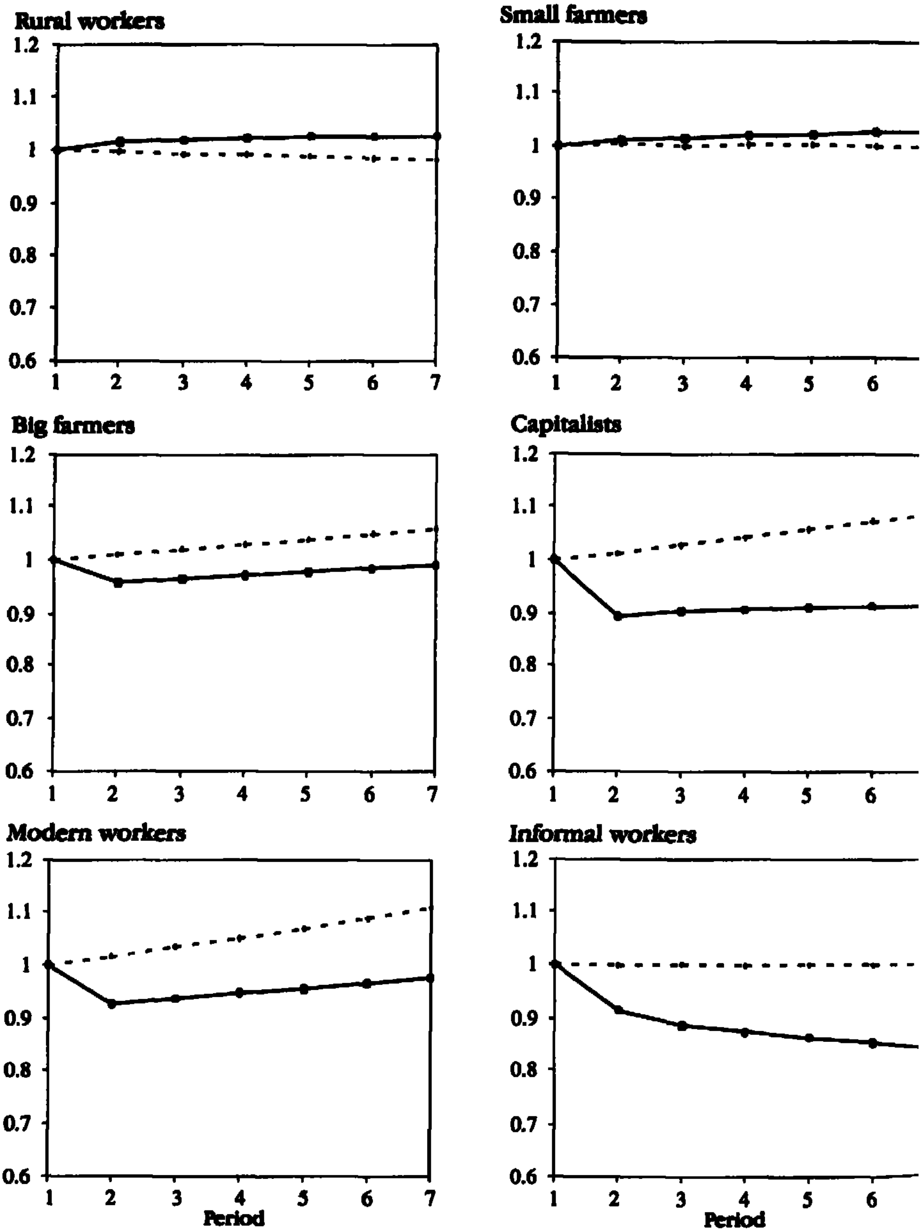
A second clear pattern is the deterioration in fiscal indicators, which is particularly pronounced for the Latin American archetype. Although the deterioration is rather extreme because we have purposely not built in contractionary fiscal policies in the standard adjustment package, it is interesting that the exploding fiscal deficit in the Latin American archetype is almost entirely due to interest payments on the internal and external debt.

This sharp fiscal deterioration in the Latin American archetype results from the price rigidities impairing resource use. Unemployment goes up sharply because of real wage rigidity in period 2, and capacity falls with a lag because of the resistance of capitalists to a fall in the profit rate in the modern sector. As a result, in contrast with the African archetype, in which the real exchange rate devaluation achieves expenditure switching with a concomitant increase in export earnings, in the Latin American standard adjustment pattern, export earnings remain at the same level as in the base simulation. Stagnant export earnings and a severe output contraction imply less government tax revenue. The deterioration in government revenue along with rising interest payments results in a large crowding out of private sector investment and a tripling of the real interest rate (compared with the no-shock simulation) by period 7.

For the African archetype the assumption of wage and price flexibility minimizes the adverse growth effects of the shock, and poverty and income distribution actually improve. As discussed below, the improvement in the poverty and distributional indicators comes from the expenditure switching policies, which raise the real income of the poor and improve their relative position. However, poverty and distributional indicators in the Latin American archetype are significantly worse because of three factors. First, wage and price rigidity slows growth and raises the fraction of the population in poverty. Second, the richer socioeconomic groups, which own capital, resist the cuts in living standards. Third, big farmers and capitalists are able to avoid capital losses by shifting their portfolios toward foreign-denominated assets.

The evolution of the distribution of income across socioeconomic groups is shown in figures 1 and 2. In the African archetype the real exchange rate

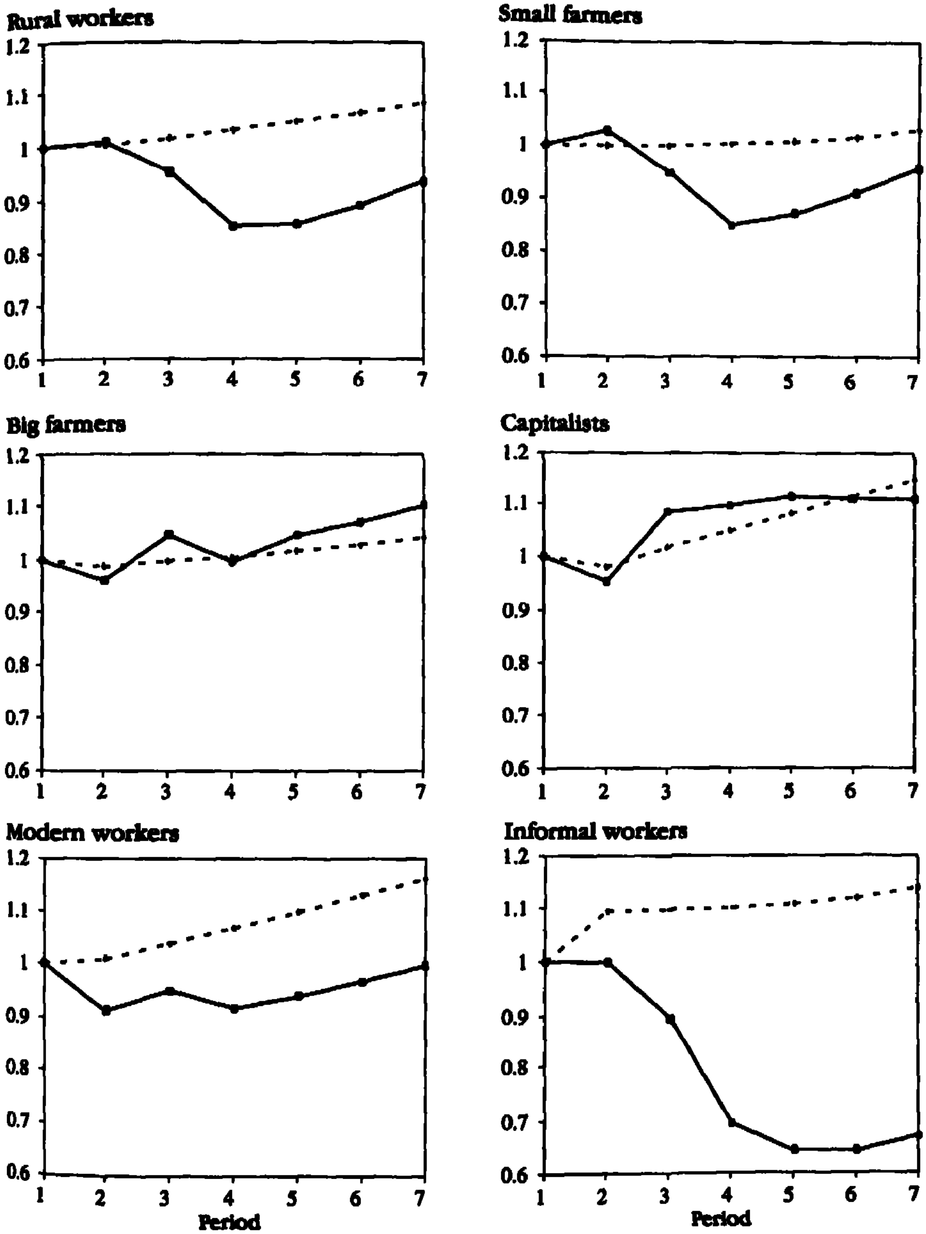
Figure 1. ***Distributional Effects of External Shock in the African Archetype***
(real income per capita index)



Note: ■—— With shock, +- - - without shock.

Source: Authors' calculations.

Figure 2. ***Distributional Effects of External Shock in the Latin American Archetype***
(real income per capita index)



Note: ■—— With shock, +- - - without shock.
Source: Authors' calculations.

devaluation raises the real income of rural workers beyond levels reached in the no-shock environment, and small farmers, who earn part of their income from wages in the export sector, lose very little from the shock. The burden of adjustment falls most heavily on workers in the nontraded informal sector, who lose not only because of the fall in the relative price of nontradables but also because of the decline in the real income of capitalists, who have a high income elasticity of demand for informal sector services. Modern sector workers lose somewhat less than capitalists because their average wage includes the exogenously set real wage of civil servants. Mobility across modern sectors also mitigates the effects of the shock. The distribution of income becomes less unequal in the African archetype as a result of the shock because devaluation protects the poorest socioeconomic groups, rural workers, and small farmers.

A strikingly different pattern emerges under the standard adjustment pattern in the Latin American archetype. Despite the sharp recession under adjustment, capitalists and big farmers manage to maintain and even improve their absolute real income. All wage earners suffer, and real income falls in the informal sector. Modern sector workers lose on average in spite of real wage resistance in great part because of increased unemployment, which results in decreased per capita income in the sector. Finally, the fate of small farmers and rural workers is similar, with both losing because of recession. Clearly, under this adjustment scenario in which the poor have to share income with the unemployed and cannot protect their money holdings from the inflation tax, the shock widens income disparities among socioeconomic groups.

III. Distributional Effects of Alternative Adjustment Packages

We have seen that differences in assumptions about market adjustment and about household opportunities to protect themselves from shocks can account for radically different distributional effects of identical external shocks and adjustment policies. We now evaluate the distributional effects of the three adjustment packages described in the introduction. As before all policy changes occur in period 2.

In the rationing adjustment package, adjustment occurs through import rationing, with the Central Bank sticking to an exchange rate policy that maintains a constant real exchange rate pegged to CPI domestic inflation. This adjustment scenario reflects a policy of postponing adjustment, which we assume can last for the seven years in the simulation. The proceeds of the rents accruing from the premium on imports are distributed pro-rata (as dividends) to each sector. (Rents from the premiums on noncompetitive imports are distributed to the formal nontraded (commercial) sector.) Otherwise all other assumptions are identical to those describing the standard adjustment package. Again, to clearly trace the effects of the differences built into each archetype, we abstract from the use of the standard fiscal, monetary, and exchange rate instruments.

In the structural reform package, starting from the standard adjustment package, we apply the trade and tax reforms advocated by the IMF and the World Bank. (Tax and tariff structures across sectors in each archetype are given in appendix tables A-1 and A-2.) Export taxes are abolished for both archetypes. Uniform tariff rates are set at 15 percent for Africa and 20 percent for Latin America. Sales taxes are also equalized at 7 percent for Latin America and 3 percent for Africa, and profit and income taxes on modern sector capitalists are set at 10 percent in both archetypes. To reflect difficulties in tax administration, all tax reforms apply only to the modern sector; the nontraded informal and the two agricultural sectors are not taxed. The equalization of tax rates is designed to yield broadly the same revenue levels in period 2 as in the standard adjustment package. These tax rates may not be at the exact level actually found in the regions, but the composition of tax receipts across the categories of trade taxes, direct taxes, and indirect taxes broadly conforms to average patterns for low- and middle-income countries.

Finally, in the redistribution package the structural adjustment package is augmented by food subsidies and a public works program. Because our simulation model is not sufficiently disaggregated, especially with respect to the social sectors, this strategy, which is intended to simulate the elements of the strategy advocated in the *World Development Report 1990*, cannot reflect all the targeting and redistributive policies that would be included in a complete strategy of poverty alleviation. A food subsidy of 7 percent for the African archetype and of 5 percent for the Latin American archetype is applied to sales of agricultural products from period 2 on. The public works program is implemented so as to result in the same exogenous government nominal wage bill as in previous experiments while achieving full employment at the same time. In the African archetype average public sector wages are frozen in real terms with an increase in public employment, thereby drawing labor out of the formal sector. In the Latin American archetype average public sector real wages fall, reflecting the hiring of unskilled workers in the public works program. In this archetype government sector increases in employment come out of the pool of unemployed.

The macroeconomic and aggregate distributional effects of each one of these packages are contrasted with the standard adjustment package in table 5 and figure 3. For both archetypes the rationing adjustment package results in severe import rationing by the end of the simulation period, with premium rates on imports exceeding 100 percent. Under this scenario both poverty indicators also worsen, which is not surprising since the rents accruing from rationing redistribute real income from the poor and middle to the richer socioeconomic groups. Figure 3 indicates that the population in poverty increased from 30 to 40 percent in Africa and from 12 to 36 percent in Latin America. These estimates are very high and may exaggerate the actual adverse impact on poverty of adjustment in an economy in which rent-seeking and nonmarket mechanisms

Table 5. *Macroeconomic and Distributional Indicators for the Two Archetypes under Different Adjustment Packages*
(percent unless otherwise indicated)

Archetype and indicator	*Standard adjustment* Period 2	*Standard adjustment* Period 7	*Rationing adjustment* Period 2	*Rationing adjustment* Period 7	*Structural reform* Period 2	*Structural reform* Period 7	*Redistribution* Period 2	*Redistribution* Period 7
African archetype								
GDP (period 1 = 100)	103.0	117.0	102.0	121.0	103.0	117.0	103.0	117.0
Investment/GDP (real)	18.9	15.5	20.5	25.5	19.3	15.3	17.2	13.1
Inflation (CPI)	20.7	18.1	22.3	16.7	19.6	18.3	19.3	19.4
Devaluation rate	27.0	17.5	22.0	17.3	22.0	18.0	21.0	18.2
Premium rate[a]			27.5	102.3				
Interest rate	20.3	23.4	18.4	15.0	19.8	23.0	21.5	26.6
Government revenue/GDP	15.3	15.0	15.5	16.5	15.0	15.2	12.5	12.8
Overall deficit/GDP	5.2	9.0	6.8	12.6	5.5	8.5	8.0	11.1
Theil index[b]	61.5	50.8	61.1	47.9	57.6	46.6	55.8	45.4
Poverty gap[c]	2.8	2.7	3.5	4.8	2.3	2.3	1.9	2.1
Poverty rate	29.9	29.5	33.9	39.2	26.0	26.0	22.9	24.3
Latin American archetype								
GDP (period 1 = 100)	101.0	107.0	100.0	100.0	101.0	108.0	104.0	108.0
Investment/GDP (real)	13.8	14.8	13.9	16.1	14.4	14.6	13.4	14.2
Inflation (CPI)	108.3	30.1	102.8	27.8	102.6	30.7	108.9	30.6
Devaluation rate	108.0	31.4	100.0	26.3	103.0	31.9	109.0	32.1
Premium rate[a]			10.0	115.4				
Interest rate	49.0	42.1	48.4	37.4	47.9	42.7	49.3	43.3
Government revenue/GDP	11.5	12.6	13.7	12.9	10.9	12.8	10.2	11.5
Overall deficit/GDP	8.2	17.5	8.7	23.9	8.7	17.8	9.3	18.4
Theil index[b]	32.7	43.0	32.6	45.6	31.8	41.0	32.4	42.3
Poverty gap[c]	0.9	1.5	1.0	3.8	0.7	1.2	0.6	1.2
Poverty rate	12.1	19.5	12.5	28.2	10.3	16.9	9.7	17.3

n.a. Not available.

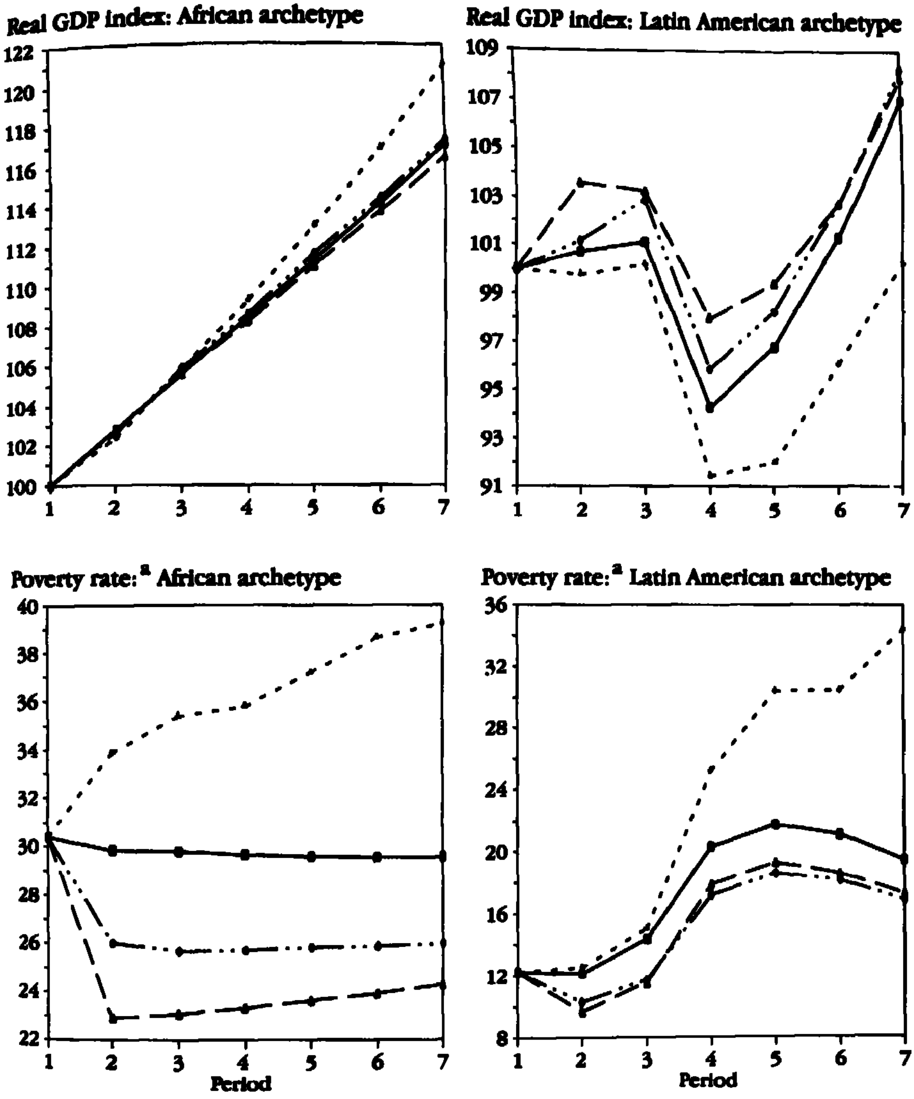
Note: Under the standard adjustment package the exchange rate is devalued, with the rationing adjustment package there is import rationing, with the structural reform package there is tax equalization, and under the redistribution package there are tax equalization, food subsidies, and public works.

a. Premium rate on imports under rationing.

b. A decrease in the value of the index indicates less income inequality.

c. The poverty gap indicates the percentage of income that must be redistributed to bring all those below the poverty line up to the poverty line.

Figure 3. *Growth and Poverty under Alternative Adjustment Packages*



Note: Standard adjustment, rationing adjustment, structural reform, redistribution.

a. Head count index.

Source: Authors' calculations.

are commonplace. The higher growth in Africa with the rationing adjustment package is induced by a strong Kaldorian effect. Income is redistributed from households to firms and capitalists through the quasi-rents on imports. Given that capitalists have a higher propensity to save, the rate of interest drops and investment expenditures increase. Of course this expenditure-switching phenomenon occurs because wage and price flexibility ensures that the economy is at full employment. Over time the increased share of investment in GDP also leads to substantially faster growth.

The overall effect on income distribution is mixed. The drop in household consumption contributes to a fall in agricultural prices and thus in the real income of all rural groups, including poor rural workers and smallholders. Big farmers in the primary export sector also lose a substantial proportion of their income, however, because the real exchange rate does not fall as in the standard adjustment scenario. Since the Theil measure of inequality is very sensitive to changes at the top of the distribution, the overall result is a slight drop in inequality. Some other measures of inequality would indicate the opposite.

Although the preceding effects also operate in the Latin American archetype, resistance to real wage cuts and price rigidity in modern sectors prevents the preceding Kaldorian expenditure-switching phenomenon. Because of price rigidities, import rationing cuts real expenditures and reduces economic activity. The rate of unemployment thus is much higher than in the standard adjustment package, with a consequent deterioration in poverty indicators. The outcome is that real GDP stands at the same level as in the base year at the end of the seven-year simulation. At the same time, in spite of a lower real cost of servicing the external (and internal) debt, the overall fiscal situation is worse under this scenario because of forgone trade tax revenues caused by the refusal to devalue the real exchange rate. In sum the rationing adjustment scenario has strongly adverse effects on poverty.

Compared with the rationing adjustment scenario, the two reform packages (structural reform and redistribution) yield relatively smaller effects of the shock precisely because the reforms are once-and-for-all measures introduced in period 2. Overall, with either reform package, the macroeconomic indicators are very close to the values achieved under the standard adjustment package, although there is a slightly larger fiscal deficit in the redistribution package at the end of the simulation. As can be seen in figure 3, the change in the poverty rate occurs in period 2, as soon as the reforms are implemented. Significantly, the redistributive effect achieved in the African archetype in period 2 is largely maintained throughout the entire simulation. Clearly, if it is possible to carry out trade and tax reforms that improve allocative efficiency by equalizing incentives across sectors and to implement revenue-neutral redistributive measures, then it is possible to reduce poverty.

At a more general level structural reforms will be largely unsuccessful when there are rigidities, as in the Latin American archetype, that prevent adjustment in relative prices. Under those circumstances reforms will not induce firms to

work closer to full capacity. From the simulations with the African archetype, in which (effective) indirect taxes are relatively low and production structures are relatively rigid because of largely noncompetitive imports, reforms have a negligible effect in the small modern sector. Hence efficiency gains are small. Of course abolishing export taxes benefits the agricultural sector, reduces poverty, and equalizes income, but the expansionary effect on output is negligible because of diminishing returns in agriculture.

IV. Conclusion

The question raised in the introduction to this article was whether differences in economic and market structure and levels of institutional development were important in the analysis of adjustment policies on poverty and income distribution. We asked whether these differences could result in identical adjustment policies applied in response to a common external shock having radically different, and even opposite, effects on poverty and income distribution. Although such an outcome is not in itself surprising, differences in magnitudes and in the channels that account for these results were often found to be interesting and at times surprising. These results suggest a payoff to the careful modeling of relevant differences across countries in an economywide setting when analyzing the effects of adjustment policies on poverty and income distribution.

Several important differences emerged in the comparisons of different adjustment packages across the two archetype economies. As an illustration, we recall three results. The first is the result that, in the standard adjustment package, inequality increased significantly for the Latin American archetype but decreased significantly for the African archetype. We traced these differences to two factors: the ability of the rich to protect their financial assets through capital flight in the Latin American archetype and the flexibility in the African archetype, which helps the poor as the real incomes of the rural areas are raised through higher export earnings induced by the real exchange rate depreciation. The second result, often stressed by structuralists, is that adjustment can lead to a sharp redistribution of income from groups with low marginal propensities to save toward groups with high marginal propensities to save. In the context of supply- (rather than demand-) constrained economies, such Kaldorian redistributive effects will tend to raise investment and growth, which helps reduce poverty. The third result is that redistributive policies through trade and tax reforms that improve allocative efficiency by equalizing incentives across sectors can reduce inequality significantly, provided that governments are able to implement these revenue-neutral redistributive measures.

There were also other interesting differences. These included the relatively small effects of reforms on growth and income distribution in both archetypes, even though the reasons for this were found to be different for each one. Perhaps most significantly, we showed that our macro-micro model replicated broadly the stylized changes in the value of the macroeconomic indicators during the

1980s (lower growth, a fall in the investment share in GDP, a current account deterioration because of higher interest payments on the external debt, and a surge in inflation in Latin America). In this context wage and price rigidities built into the Latin American archetype caused the distribution of income to worsen significantly as a result of the external shock. However, wage and price flexibility built into the African archetype insulated the distribution of income from the external shock.

APPENDIX

This appendix details briefly the assumptions made in the construction of each archetype economy. The production and final demand structure for the two archetype economies and the tax structure across sectors and socioeconomic groups is given in tables A-1 and A-2. The structure is a slight modification of what Chenery and Syrquin call the "standard" cross-country model (see Chenery, Robinson, and Syrquin 1987, chapter 3). We constructed the African (Latin American) archetype from their low-income (middle-income) cross-country model. In addition to differences in structural composition, the two economies have differences in interindustry linkages, as reflected in the lower value added to gross output ratio in the Latin American archetype. Interindustry linkages for the two archetypes are adapted from table 5.2 of Chenery, Robinson, and Syrquin (1987).

Tables A-3 to A-5 describe the initial distribution of physical and financial assets across socioeconomic groups, and the assumptions about initial publicly held foreign debt and the share of total debt held in domestic bonds. Assumptions about financial ratios for firms and the economy as a whole are given in table A-5. The African archetype initially has a lower share of external debt. The same log variance of income is used for corresponding socioeconomic groups across economies, and dispersion in within-group income is assumed to be higher for capitalists than for workers.

Table A-1. *Production and Demand Structure of the African Archetype*
(percentage of total value added)

Sector	Output	Value added	Consumption: Private	Consumption: Public	Investment: Private	Investment: Public	Exports	Imports	Intermediate demand
Primary exports	16.7	13.0	0.0	0.0	0.0	0.0	16.7	0.0	0.0
Agriculture	30.0	24.8	18.8	0.7	0.0	0.0	0.0	3.9	14.5
Light industry	28.6	10.7	7.8	0.7	0.0	0.0	0.7	6.7	26.1
Heavy industry	8.4	3.6	1.3	0.7	5.6	1.9	0.2	13.7	12.4
Services	47.3	27.9	21.0	1.2	11.3	3.9	2.2	4.6	12.4
Government	9.0	9.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0
Informal	13.0	11.0	10.83	0.0	0.0	0.0	0.0	0.0	2.2
Total	153.0	100.0	59.7	12.3	16.9	5.8	19.8	28.8	67.4

Sector	Tax structure (percent): Indirect tax	Corporate tax	Tariff	Export tax
Primary exports	14	0	0	8
Agriculture	0	0	10.6	0
Light industry	4	0	24.8	0
Heavy industry	5	0	16.8	0
Services	9	0	0	0
Noncompetitive imports			16.0	
Percentage of total tax revenue	49	0	25	10
Income tax on capital: 10 percent (16 percent of total tax revenue)				

Source: Adapted from Chenery, Robinson, and Syrquin (1987), tables 3.4 and 5.2.

Table A-2. *Production and Demand Structure of the Latin American Archetype*
(percentage of total value added)

Sector	*Output*	*Value added*	*Consumption*		*Investment*		*Exports*	*Imports*	*Intermediate demand*
			Private	*Public*	*Private*	*Public*			
Primary exports	6.1	4.3	0.0	0.0	0.0	0.0	4.6	0.0	1.5
Agriculture	11.4	8.0	7.7	0.0	0.0	0.0	0.0	3.0	6.7
Light industry	46.1	17.0	21.0	0.0	0.0	0.0	4.6	4.0	24.5
Heavy industry	31.4	15.7	3.6	0.0	7.8	1.1	2.9	13.2	29.2
Services	55.4	32.8	22.0	0.0	12.8	1.9	5.1	4.3	17.9
Government	6.0	6.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0
Informal	20.0	16.2	15.0	0.0	0.0	0.0	0.0	0.0	5.0
Total	170.4	100.0	69.4	0.0	20.6	3.0	17.2	24.5	84.8

	Tax structure (percent)			
Sector	*Indirect tax*	*Corporate tax*	*Tariff*	*Export tax*
Primary exports	2	0	0	5
Agriculture	0	0	8	0
Light industry	1	8	45	0
Heavy industry	2	8	40	0
Services	4	8	0	0
Noncompetitive imports			41	
Percentage of total tax revenue	31	5	48	2
Income tax on capital: 10 percent (14 percent of tax revenue)				

Source: Adapted from Chenery, Robinson, and Syrquin (1987), tables 3.5 and 5.2.

Table A-3. *Private Sector Distribution of Assets and Liabilities in the African Archetype*
(percent unless otherwise indicated)

Factor of production	*Production sector*	*Socioeconomic group* Capitalists	*Big farmers*	*Small farmers*	*Landless agricultural workers*	*Modern workers*	*Informal workers*	*Total*
Distribution across socioeconomic groups								
Land	Primary export	20	80					100
	Agriculture		55	45				100
Labor	Primary export		1.8	7.8	11.8			21.4
(labor units)	Agriculture		4.2	18.2	27.4			49.8
	Consumer goods		0.8			3.2		4.0
	Intermediate and capital goods					0.4		0.5
	Nontraded formal		1.2			4.6		5.8
	Informal						14.0	14.0
	Total		8.1	26.0	39.2	8.2	14.0	95.5
Capital	All sectors	62.0	27.4	1.4	6.3	0.7	2.2	100.0
Financial assets ratios								
Money/income		10	10	10	10	10	10	
Savings/income		42	26	2	1	6	3	

Source: Authors' calculations.

Table A-4. *Private Sector Distribution of Assets and Liabilities in the Latin American Archetype*
(percent unless otherwise indicated)

Factor of production	Production sector	Socioeconomic group: Capitalists	Big farmers	Small farmers	Landless agricultural workers	Modern workers	Informal workers	Total
Distribution across socioeconomic groups								
Land	Primary export	20	80					100
	Agriculture	10	55	35				100
Labor	Primary export		0.3	1.8	5.6			7.7
(labor units)	Agriculture		0.8	4.2	12.3			17.3
	Consumer goods	0.8				11.6		12.4
	Intermediate and capital goods	0.4				6.7		7.1
	Nontraded formal	0.8				11.4		12.2
	Informal						27.0	27.0
	Total	2.0	1.1	6.0	17.9	29.7	27.0	83.7
Capital[a]	All sectors	33.6	4.7	0.2	0.5	16.3	4.7	60.0
Financial assets ratios								
Foreign assets/financial wealth		30	20					
Domestic bonds/nonmonetary assets		70	30					
Money/income		10	10	10	10	10	10	
Savings/income		41	21	2	2	8	5	

a. This does not add up to 100 percent because of the assumption of 40 percent retained earnings.
Source: Authors' calculations.

Table A-5. *Financial Assumptions*
(percent)

Sector	Firm financial ratio					
	African archetype			Latin American archetype		
	Liabilities/ assets	Working capital/sales	Foreign debt/ total debt	Liabilities/ assets	Working capital/sales	Foreign debt/ total debt
Primary export	5	10	0	5	15	0
Agriculture	5	10	0	5	15	10
Consumer goods	30	10	0	25	15	10
Intermediate and capital goods	30	10	0	25	15	10
Nontraded formal	30	10	0	25	15	0
Informal nonagriculture	0	10	0	0	0	0

	Economywide ratio	
	African archetype	Latin American archetype
Debt/exports	164	100
Money supply/sales	15	40
Domestic bonds/government debt	0	25

Source: Authors' calculations.

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How Did Workers Benefit from Bolivia's Emergency Social Fund?

John Newman, Steen Jorgensen, and Menno Pradhan

Bolivia's Emergency Social Fund (ESF) was established to cushion the adverse effects on the poor of the economic crisis and subsequent stabilization program in the 1980s and to facilitate transition through the phases of structural adjustment. The ESF provided temporary employment opportunities by funding small-scale, labor-intensive projects that were proposed by local governmental and nongovernmental organizations. This article measures the impact of the ESF program on employment and income of workers in the ESF projects. For the average ESF worker, hourly wages were 12.8 percent higher, the work week was 9.5 hours longer, and weekly earnings were 32 percent higher than what they would have been without the ESF. Taking into account the probability that the individual may not have worked without the ESF leads to larger gains. The greatest benefits from participating in the program were received by those who would have been least well-off without it.

Bolivia's Emergency Social Fund (ESF) represented one of the first World Bank-funded efforts to address the social costs of adjustment through creating a separate compensatory program, rather than by modifying the implementation of a structural adjustment program in light of the expected social costs. Although the primary emphasis of this program was to provide temporary employment opportunities, it differed from more typical government works projects in several important ways. First, the program was intended to be demand-driven. The management team of the ESF approved or rejected funding requests for small-scale, labor-intensive projects that came from local governmental and nongovernmental agencies, but did not propose any projects themselves. Second, the ESF did not directly employ the workers. Rather, the projects were executed and the workers hired by private subcontractors working under the supervision of the local agency and the central management team of the ESF. Third, the ESF was established explicitly as a temporary financial institution outside of the normal bureaucratic structure of the government.

There are several avenues through which a compensatory program such as the

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ESF can affect the transition through the structural adjustment process. It may contribute political support to carry out the adjustment policies, create infrastructure that reduces the cost of producing tradable goods, and alter workers' incentives to move toward favored sectors. As in any program designed to alleviate the social costs of the adjustment process, there is a tension between easing the adverse impact and counteracting the necessary reforms. Because the ESF's economic infrastructure projects generated employment in the nontraded goods sector, they did not directly contribute to shifting the structure of production toward traded goods. Indeed, they raised the return to employment in the nontraded goods sector. If the ESF is to aid in the transition, its contribution toward easing the transition (the economic infrastructure and the income maintenance) must in some sense outweigh its negative effect in counteracting the reforms (the impact on nontradables).

Quite apart from the ESF's role in the adjustment process, interest has been expressed in Bolivia's experience with the demand-driven mechanism used to distribute the funds. Under the auspices of the ESF, substantial external funds were generated and channeled to a large group of smaller governmental and nongovernmental organizations. Rapid disbursements were facilitated by the ESF's use of the market and its reliance on local groups to propose projects and mainly private subcontractors to execute them. The ESF's success in quickly disbursing large sums has motivated efforts to establish similar social investment funds in other countries (notably in Guatemala, Haiti, and Jordan), either with or without a connection to a structural adjustment program.

Because different groups have been interested in different aspects of the ESF, there is no single criterion for measuring the success of the program and, consequently, no single source of information on which to judge the program. At the risk of oversimplification, one can identify four different views of the ESF. Depending on the perspective of the observer, the ESF was (a) a Keynesian aggregate demand policy designed to keep the economy from contracting further during the structural adjustment process, (b) an institution to channel externally generated funds down to local groups that previously had no access to this type of funding, (c) a program to compensate those who suffered the greatest loss due to adjustment, or (d) a program to protect the poor and vulnerable during adjustment. (Those individuals in group d. are not necessarily the same as those in group c.)

Initially, the predominant view of ESF's role was that it should generate external funds and quickly inject them into the economy. External funds were necessary because financing the project out of domestic funds would have made it that much harder to achieve the budget deficit reduction objective of the structural adjustment program. To judge how well the ESF did in this regard, one need only consult the administrative record. By the end of 1988, the ESF had raised more than $100 million in foreign currency, an amount equal to about one-fourth of the current account deficit in 1988. Most of the foreign financing received has been in the form of grants. There is reason to believe that foreign aid inflows

would have been considerably lower without the ESF; several donors have begun or resumed programs in Bolivia because the ESF was able to ensure efficient and speedy implementation. In addition, the ESF's administrative costs amounted to no more than 3 percent of its budget, and the average lag between dates of commitment and disbursement of all funds was less than one year in the ESF, shorter than even fast-disbursing balance of payments support. The ESF was effective in making resources available to municipalities, community organizations, and nongovernmental organizations (NGOs), which, because of their size, do not typically receive funding from international organizations. By the end of 1988, the ESF had committed about $20 million or 20 percent of its total commitments to NGOs.

Despite the initial view of the ESF's role, the viability of social investment funds and the benefits of a program like the ESF cannot be judged solely on the basis of the administrative record. The administrative record provides a measure only of the inputs (the expenditure of the investment fund) and not the outputs of the investment fund. Moreover, it remains an open question whether the success the ESF has had as a temporary institution operating to a large extent independently of the line ministries and outside of many normal constraints can be replicated in a permanent institutional framework. The experience that will come with the successor to the ESF in Bolivia (the Social Investment Fund) and with social investment funds elsewhere will be a strong test of the institutional viability of a permanent social investment fund.

Judging the effectiveness of the ESF's institutional structure, its role in compensating those adversely affected by the structural adjustment, and its contribution toward protecting the poor during adjustment necessitates information on the outputs of the program—the value of the infrastructure created and the impact of the program on beneficiaries. Grosh (1990) describes evaluations of some facets of the ESF that have been conducted, including (a) a technical audit of the technical and engineering quality of its civil works; (b) an early evaluation and monitoring report conducted by a team of economists and sociologists; (c) a community participation study conducted by anthropologists through open-ended but structured interviews; (d) an ex post cost-benefit analysis of a small sample of completed projects; (e) a study of the macroeconomic impact, which compares the results of investing through the ESF with results from investing through alternative channels; (f) a study of the impact on institutions with which the ESF worked; (g) a study of its impact on one particular community; and (h) a study on the geographic targeting of projects.

This article is concerned with measuring the impact of the ESF program on the employment and income of workers in the ESF projects. Two aspects of the ESF's effect that are not addressed in this article are worth mentioning. First, given the relatively small size of the ESF program, we do not estimate spillover effects of the program on the urban labor market in general. Second, we are not concerned here with estimating the value of the economic infrastructure created (see Herrick 1989 for a benefit-cost analysis of the infrastructure created). Neverthe-

less, it is important to recognize that some of the objectives of the program n evaluated here, namely, to generate productive economic infrastructure and generate and disburse funds quickly, imposed constraints on the extent of em ployment generation and income maintenance that resulted from the ESF. Fo example, because economic infrastructure projects were managed by sul contractors who decided whom to hire, almost no women were hired. This not surprising because these were construction projects and extremely fe women work in the urban construction sector in Bolivia. If the infrastructu output of this employment and income maintenance program is highly value then it may still be appropriate to fund such projects even though the mix of th workers hired does not match the desired targets.

Our analysis of the effect of the ESF projects on employment and incomes based on the results of a survey administered to workers in ESF infrastructu projects and to the population at large by the Instituto Nacional de Estadístic of Bolivia. In the first part of the article we identify the characteristics of th workers in the ESF infrastructure projects and compare these workers with th population in general and workers in the construction sector in particular. In th second part of the article we perform a counterfactual simulation, asking wha would have been the position of the ESF workers without the ESF program. Base on this simulation, we infer the employment and income effect of the ESF pro gram on its beneficiaries.

I. Background to the ESF

The Bolivian economy deteriorated rapidly and continuously after 198(reaching a point of chaos by 1985. In retrospect, the causes are clear. In th 1970s, an artificial boom, fed by capital inflows, followed the discovery o substantial hydrocarbon resources. The boom lasted as long as access to foreig financial resources was easy. When capital inflows slowed in 1980, economi performance deteriorated sharply: net foreign transfers became strongly nega tive, gross domestic product (GDP) fell in real terms, and capital flight accele ated. Economic policies became erratic and inconsistent. By September 198 inflation had reached 24,000 percent a year, real GDP per capita had fallen b more than a fifth since 1980, and public sector deficits were about one-fourth o GDP.

When the government of President Paz-Estenssoro took office in Augu 1985, an orthodox, wide-ranging stabilization package was introduced. Th package freed most prices, deregulated the trade system and the labor marke established a uniform exchange rate (determined through daily auctions), an cut public sector deficits. Inflation was immediately curtailed and has remaine low; inflation was 11 percent in 1987 and 21 percent in 1988 and 1989. Publi sector deficits have been brought under control, and the exchange rate ha remained unified. Growth was impeded by serious negative terms of trad

shocks in the first year of the program, but the economy grew slowly in 1987, 1988, and 1989.

The effects of the economic program on the public sector were especially dramatic. The government set out to fundamentally change the role of the public sector. The public sector's new role was to efficiently provide basic public services, engage in only limited extraction and processing of natural resources, and provide a "level playing field" for the private sector. The state mining sector was closed for restructuring, and 90 percent of its employees were fired. Public sector salary policy was left to individual departments to determine under a fixed wage bill, and the accounting and control system in the public sector was reformed.

From the outset of the adjustment program, the Bolivian government attached a high priority to preventing any further deterioration in social conditions. This was the result not only of concerns over the effect of economic dislocation on the already very low living standards of the Bolivian poor, but also of fear that increased hardship would strengthen opposition to the government's policies. Several plans were considered for alleviating the social costs of adjustment before deciding on the ESF. The early discussions in 1985 revolved around more traditional programs of widespread distribution of food or medicines, or direct subsidies for selected items. These approaches presented a number of difficulties. First, the administrative cost of directly providing or subsidizing the purchase of commodities to low-income groups would be high. Second, providing free food (particularly if taken from international donations) would discourage domestic food production and increase the country's dependence on food imports. Third, permitting recipients more discretion in the use of assistance (providing money instead of food, for example) would be more consistent with the new reduced role of the state. Fourth, the government did not wish to impose a uniform method of assistance, but rather to respond to the demands of local groups that would be in a better position to evaluate the most immediate needs.

In answer to these concerns about traditional programs, the ESF was established in November 1986 to provide funds for small-scale, labor-intensive projects, mostly in infrastructure. The program was to be demand-driven, meaning that the ESF would finance projects proposed by local groups. The focus on labor-intensive, infrastructure projects was adopted to increase employment among the poor while at the same time providing services to the community that would aid development. The ESF was primarily a financing institution. It was not involved in implementing projects, except for some supervision and technical support. The organizations that received funding were responsible for hiring workers and ensuring that projects moved toward completion.

The ESF was designed as a temporary institution, scheduled to disappear in December 1990. It was hoped that in four years' time growth would have picked up enough to solve the employment problem, and the need for austerity mea-

sures would be lessened, which would allow increases in social spending as part of the regular budget. The ESF's total program was planned as $180 million over the life of the institution, with $8 million coming from the Bolivian government and the rest from external sources in the form of grants or loans at concessional rates.

The ESF funds projects in four basic categories: economic infrastructure, social infrastructure, social assistance, and production support. Economic infrastructure (amounting to 37.8 percent of committed funds) encompasses infrastructure closely related to productive activities, including road maintenance and upgrading, urban improvement, irrigation, flood control, and reforestation. Social infrastructure (47.6 percent of committed funds) covers infrastructure for health and education, water and sanitation, basic housing (mostly self-construction), and some cultural projects (for example, repairs of historic buildings). Social assistance (8.8 percent of committed funds) covers recurrent costs in education and training, vaccinations, school breakfasts, and production of school materials. Production support (5.7 percent of committed funds) is mainly credit provided through ngos to productive units that are outside of the formal financial system, such as microenterprises producing for the informal sector and small cooperatives in mining and agriculture.

II. The Data

The ESF management team commissioned ex post evaluations of the economic returns of the projects and surveys of the beneficiaries of the employment-generating projects. Information on ESF workers was obtained from a special survey conducted by the Instituto Nacional de Estadística. Information on the general population was obtained from the 1988 Encuesta Permanente de Hogares, part of a continuing survey that has been conducted yearly by the Instituto since 1976. The 1988 Encuesta survey took place in May and covered urban households in nine provincial capitals. For the ESF survey, the Instituto selected all projects in execution that were in capital cities, in operation at the time of the Encuesta survey, and in economic infrastructure (that is, explicitly employment-generating). A total of sixty-four projects employing 3,051 workers met these requirements. The Instituto staff then visited the projects to determine the actual number of workers employed at the projects and drew a random sample of 600 workers from the list of all workers. The ESF workers were visited in their homes and were administered the same household questionnaire as that of the Encuesta sample. Table 1 indicates the distribution of all workers in the sixty-four projects and of the sample across all cities.

ESF workers were surveyed separately for two reasons. First, at the time of the survey the number of ESF workers was small, so the probability of finding a sample of ESF workers sufficiently large for analytical work in a sample of the general population was low. The 3,051 ESF workers in the capital cities constituted just 0.3 percent of the economically active population and 2.7 percent of the

Table 1. *Distribution of Workers in Sixty-Four ESF Economic Infrastructure Projects*

Capital city	*Number of project workers in ESF projects*	*Number of project workers in random sample*
Cobija	86	17
Cochabamba	403	80
La Paz	1,296	255
Oruro	492	96
Potosi	401	79
Santa Cruz	82	16
Sucre	173	34
Tarija	118	23
Total	3,051	600

Source: Instituto Nacional de Estadística (1988); Fondo Social de Emergencia (1988).

unemployed in these cities. Second, previous pilot surveys indicated that many of the workers in ESF-financed projects did not know that the ESF was a funding source. (And when the Instituto visited the ESF workers for the 1988 survey, having obtained their names and addresses from the subcontractors, most of the workers had not even heard of the ESF.) To guarantee that ESF workers would be properly identified and interviewed, therefore, a separate sample consisting only of ESF workers was drawn.

III. ESF Workers: Characteristics, Earnings, Hours Worked, and Wages

The workers in these ESF projects are, for the most part, prime-age married males who are heads of households. Ninety-nine percent are male, and 71 percent are married. Ninety-one percent are between twenty and sixty-five years old, and 93 percent are reported as head of the household. These workers are the primary income earners in their households, and the earnings from the ESF projects are their main source of income. In 62 percent of the ESF households there is only one reported income earner, in 25 percent there are two, and in 9 percent there are three. Only 7.2 percent of the ESF workers have a secondary job.

Most of the ESF projects in the capital cities are in the construction sector, and 91 percent of the ESF workers work in construction. This percentage is high because of the selection of only projects in economic and social infrastructure. We compare the ESF workers with other workers in the construction sector and with workers in general, using information from the Encuesta sample. Compared with other workers in the construction sector, ESF workers are less educated. The distribution over the different educational levels is given in table 2.

Thirty-nine percent of the sample responded that they were looking for work before working in the ESF project, whereas 54 percent reported that they had a job before joining. Of those who had a job, 60 percent worked in construction, either as an independent or wage worker. That is, a little over 30 percent of all

Table 2. *Educational Levels of Surveyed Workers*
(percent)

Level of education attained	*Percentage of ESF workers*	*Percentage of all construction workers*
None	6.2	4.4
Basic	41.1	36.8
Intermediate	24.1	15.8
Middle	25.9	26.9
Technical	0.6	3.5
Normal	0.2	0.6
University	1.9	12.0

Source: Instituto Nacional de Estadística (1988a, 1988b).

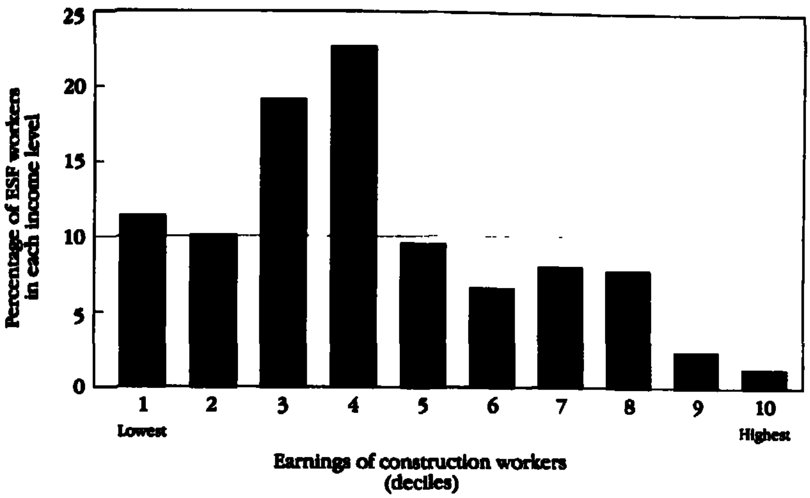
those working in ESF projects were working on construction jobs before working on the ESF projects.

Although the ESF workers have low skills relative to the *average* construction laborer, their mean monthly earnings of 225 bolivianos (Bs225) exceeded those of other low-skilled construction workers in the Encuesta sample (Bs194). Mean monthly earnings were Bs375 for the average prime-age male construction worker in the Encuesta sample, and Bs348 for the average prime-age male in the population at large. The median monthly earnings were Bs194 for workers in ESF projects, Bs220 for prime-age males in the construction sector, and Bs230 for prime-age males in the population in general.

Figure 1 presents the distribution of ESF workers across the deciles of monthly earnings of males 18 to 65 years old in the construction industry. Figure 2 presents a similar distribution of ESF workers across the monthly earnings deciles of all males 18 to 65 years old in the Encuesta sample. The height of the bars indicates the percentage of ESF workers with monthly earnings that would place them in the given decile in the Encuesta sample. For example, in figure 1, 11 percent of the ESF workers receive monthly earnings that place them in the poorest decile of construction workers. Compared with both construction workers and urban workers in the Encuesta sample, ESF workers tend to be overrepresented in the third and fourth poorest deciles and severely underrepresented in the richest deciles. Although the earnings of all ESF workers are low relative to earnings in other countries, figures 1 and 2 illustrate that not all the workers in the ESF projects are low-income workers by the standards of the urban Bolivian work force. Similarly, data on the distribution of family income of ESF workers indicates that ESF families fall disproportionately in deciles 3 through 6 and are underrepresented in the lower and upper deciles.

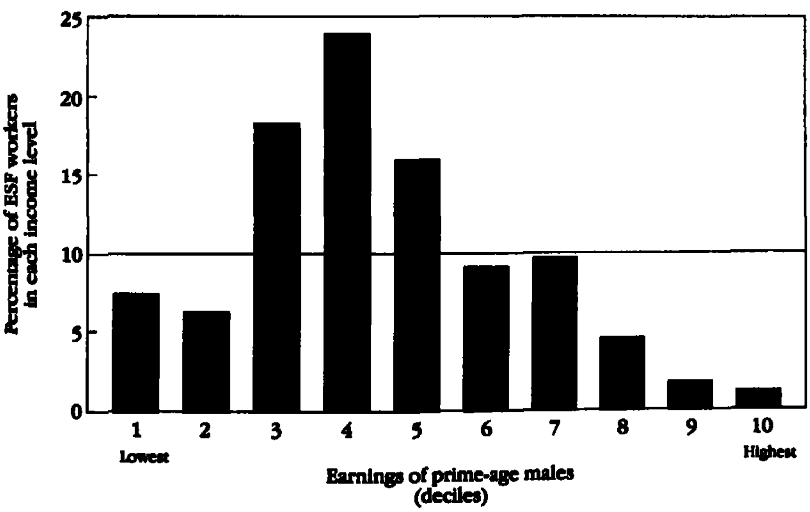
The workers in the ESF projects work more hours, on average, than the prime-age males in the Encuesta sample: 50.3 hours a week compared with 46.8 for the Encuesta workers. Compared with other prime-age males in the construction sector and the population in general, the distribution of hours worked by ESF workers is less variable, with 56 percent of the workers working 46–50 hours a week, and 95 percent working more than 40 hours a week. In the Encuesta sample, 39 percent worked 46–50 hours a week, and 77 percent worked more than 40 hours.

Figure 1. ***Earnings of ESF Workers Compared with That of All Construction Workers***



Note: Decile ranges are calculated from all construction workers' earnings (Encuesta sample).
Source: Instituto Nacional de Estadística (1988a, 1988b).

Figure 2. ***Earnings of ESF Workers Compared with That of All Prime-Age Males***



Note: Decile ranges are calculated from all workers' earnings (Encuesta sample).
Source: Instituto Nacional de Estadística (1988a, 1988b).

Table 3. *Distribution of ESF Families by Family Earnings and Food Expenditure*
(percentage of ESF families)

Family earnings (quartile)	*Food expenditure (quartile)* Lowest	Second lowest	Second highest	Highest	Total
Lowest	12.9	5.5	2.4	0.7	21.5
Second lowest	16.5	19.2	7.0	1.0	43.7
Second highest	4.3	9.6	9.6	2.9	26.4
Highest	0.9	2.2	2.9	2.4	8.4
Total	34.6	36.5	21.9	7.0	100.0

Source: Instituto Nacional de Estadística (1988b).

The mean hourly wage of workers in the ESF projects was Bs1.16 compared with a mean hourly wage of Bs2.28 for all construction workers in the Encuesta sample. The median hourly wage is Bs0.98 for ESF workers and Bs1.29 in the Encuesta sample.

Table 3 presents the distribution of ESF families by family earnings and food expenditure. In general, the ESF families appear to be worse off if judged by their position within food expenditure quartiles as opposed to family earnings quartiles. For example, 34.6 percent of the ESF families are in the lowest food expenditure quartile, whereas only 21.5 percent of the ESF families are in the lowest family earnings quartile. And 17 percent of the families are in the highest two earnings quartiles and the lowest two food expenditure quartiles. Although it is possible that measurement error in either food expenditure or family earnings resulted in a misclassification of some families into the wrong cell, the observed relation between expenditure and income is what one would expect given the temporary nature of ESF jobs. The ESF families may not have changed their expenditure patterns in response to the temporary gain in income, so that movement into a higher earnings quartile was not accompanied by movement into a higher food expenditure quartile.

Eleven percent of the families in the lower two earnings quartiles are in the highest two food expenditure quartiles. The workers in this group may have come from relatively well-off households, because low earnings did not lead the household to have low food expenditure; they may have drawn on other financial resources that were not reported in the survey. The families who are in both the high earnings and the high food expenditure quartiles (17.8 percent) may have been relatively well-off households to begin with, or the high earnings may have raised the households' food expenditure. With limited information on the household characteristics of ESF workers, we can not tell which is the more likely explanation.

IV. Impact of the ESF Program

To ascertain the effect of the ESF on the labor market, we ask a counterfactual question: what would have been the position of the ESF workers and other

individuals in the labor market without the program? In principle, the positions of both types of workers could be estimated by holding constant local labor market conditions (the size and structure of demand) and estimating the incremental effect of the ESF program on wage offers. Because the ESF increases the demand for labor, one would expect it to increase the level of wages offered, the probability of working, and hours worked. To infer the effect on workers of the ESF program, one would compare expected wages, probabilities of working, and hours worked with the incremental effect of the ESF program with the corresponding values obtained by setting the incremental effect to zero.

Such a procedure requires an accurate indicator of the size of the ESF program in the different capital cities. At the time of the survey, there was substantial variation both in local labor market conditions and in the size of the ESF program. The variation in the ESF program, however, was not random. The actual size of the program reflected the number and size of proposals that were received from each city and the funding decision rules of the ESF's management team. The management team attempted to fund projects in cities where wages were low and where unemployment and underemployment were high. Because of this nonrandom allocation, the inclusion of a direct measure of ESF size (for example, the number of ESF workers or expenditure in each city) would generate biased estimates of the program's effect. The ESF measure would be correlated with the error terms in the equations explaining wages and labor force participation because of its correlation with unobserved local labor market conditions.

This is a common problem in evaluating government programs (Rosenzweig and Wolpin 1986) and is typically solved by incorporating information on the program implementation to distinguish between the effects of the allocation and the impact of the program. Evaluating a demand-driven program such as the ESF can be even more difficult than the typical case if the applications for the projects are correlated with the variables of interest. If the applications and other variables are uncorrelated (as would be the case if the underlying capacity to generate proposals was randomly distributed across cities), then information on the applications could serve as an instrument for the size of the ESF program. No additional information on the decision rules would be needed. If the initial applications are not randomly distributed across the cities, however, then even knowledge of the management's decision rules may not overcome the problem of a nonrandom allocation of the ESF program. Additional information would have to be available on the ability of a city to generate fundable proposals.

Our attempts to measure the incremental effect of the ESF program using the dollar amount of applications in each city as an instrument for the size of the program were unsuccessful. The ESF applications were in fact highly correlated with the population and unemployment rate in the city. Consequently, it proved impossible to measure any spillover benefits of the ESF program on other workers who do not participate in the program. Given, however, that the total amount of workers employed in capital cities at the time of the survey amounted to just 0.3 percent of the economically active population and 2.7 percent of the total unemployed, any spillover effects would be expected to be minimal. Thus

we focus exclusively on measuring the benefits of the ESF program to the workers who participate in the program.

The Econometric Specification

We estimate the workers' expected gains from participating in the ESF program using two models. Both are based on Heckman's (1974) model describing the determination of wages, the probability of working, and the hours of work (see also Amemiya 1985, pp. 391–93). Our first model consists of four equations that describe wage offers in the general population, the marginal value of leisure of individuals in the general population, wage offers in the ESF, and the marginal value of leisure of ESF workers. In this model, we assume that the errors in the equations for the general population are independent of the errors in the equations for the ESF. This implies that ESF workers differ from those in the general population only in their observed characteristics, not in unobserved characteristics, and it allows us to estimate the wage-offer and marginal-value-of-leisure equations separately for each group.

Given the characteristics of the workers and the labor market (city) they are in, one may calculate wages, hours of work, earnings, and the probability of working from the estimated structural equations. An estimate of the workers' expected gains from participating in the ESF program is then obtained by comparing the expected wages, hours of work, and earnings while participating in the program with estimates of what they would have been without it. Under the assumptions of this first model, the counterfactual wage offers and marginal values of leisure are obtained by inserting the characteristics of the ESF workers into the estimated wage-offer and marginal-value-of-leisure equations of the general population.

A problem with this model is that ESF workers may differ from individuals in the general population in ways that are not captured by their observed characteristics. That these workers chose to participate in the ESF indicates they perceived working in the ESF to be better than their alternatives and, therefore, suggests that they might be different from the general population. Our second model takes this into consideration in estimating what the ESF workers would receive without the program. It adds an equation determining participation in the ESF and allows the error terms in the participation equation to be correlated with the errors in the wage-offer and marginal-value-of-leisure equations of ESF workers and the general population.

In this section we briefly describe the estimation procedure for the first, simpler model. The second, more complicated model is explained in the appendix.

The equation describing wage offers in the general population, w^o, is

$$\ln w^o = X_1' \beta_1 + u_1 \quad (1)$$

where X_1 is a vector of explanatory variables, and u_1 is a random error term. Wage offers are assumed not to depend on the hours of work, although this assumption could be relaxed.

The individual's marginal value of leisure, w^r, is specified as a function of a set of exogenous variables and the individual's hours of leisure, (total time available minus the hours of work):

$$\ln w^r = Z_1' \alpha_1 + \gamma_1 H + u_2 \tag{2}$$

where Z is a vector of explanatory variables, H is the hours of work, and u_2 is a random error term. Errors between the wage-offer and the marginal-value-of-leisure equations for the general population are allowed to be correlated to take account of possible measurement error.

Similarly, the equation describing wage offers in the ESF, w^o_{ESF} is

$$\ln w^o_{ESF} = X_2' \beta_2 + u_3 \tag{3}$$

and the equation describing the marginal value of leisure of workers in the ESF is

$$\ln w^r_{ESF} = Z_2' \alpha_2 + \gamma_2 H_{ESF} + u_4 \tag{4}$$

Again, correlation between u_3 and u_4 is allowed.

Because everyone who participates in the ESF works, we do not have to consider their decision whether or not to work. We do have to consider this decision for those in the general population, however. An individual in the general population will work if the offered wage is greater than the marginal value of leisure evaluated at zero hours of work, often referred to as the reservation wage:

$$\ln w^o > \ln w^r (H = 0) \equiv Z_1' \alpha_1 + u_2 \tag{5}$$

or, substituting from equation 1 and rearranging, if

$$u_1 - u_2 > Z_1' \alpha_1 - X_1' \beta_1. \tag{6}$$

Individuals who work will do so up to the point at which the marginal value of leisure is equal to the wage offer. The wage and hours worked are determined by solving equations 1 and 2 simultaneously with the condition that

$$\ln w = \ln w^o = \ln w^r. \tag{7}$$

Thus, for individuals who work, we have the following two equations:

$$\ln w = X_1' \beta_1 + u_1 \tag{8}$$

$$\ln w = Z_1' \alpha_1 + \gamma_1 H + u_2 \tag{9}$$

or, solving equation 9 for hours of work,

$$H = \frac{1}{\gamma_1} \ln w - Z_1' \frac{\alpha_1}{\gamma_1} - \frac{1}{\gamma_1} u_2. \tag{10}$$

Provided there are variables that affect the marginal value of leisure that do not also affect wage offers, all structural parameters of the model (given by equations 8 and 9) are identified.

The model was estimated using maximum likelihood techniques. The princi-

ple behind this estimation method is to choose values for the population parameters that maximize the probability of having observed the actual sample drawn. Once an assumption is made about the distribution of the error terms (u_1, u_2, u_3, u_4), it is possible to write down a likelihood function that gives the probability of observing the actual sample in terms of the parameters to be estimated. The parameter estimates that maximize the likelihood function are then found by an iterative numerical procedure. The likelihood function for the general population, L, is

$$L = \prod_0 \int_{-\infty}^{UB} f_{u_1 - u_2}(v)\, dv \tag{11}$$

$$\prod_1 f_{u_1 u_2'}\left(\ln w - X_1' \beta_1, H - \frac{1}{\gamma_1}\ln w + Z_1' \frac{\alpha_1}{\gamma_1}, -\rho_{1,2}\right)$$

where $u_2' = -(1/\gamma)u_2$, $UB = Z_1'\alpha - X_1' \beta_1$, v is a dummy of integration, and $\rho_{1,2}$ is the correlation between u_1 and u_2. The product over 0 consists of all individuals who are not working, and, for each of these individuals,

$$\int_{-\infty}^{UB} f_{u_1 - u_2}(v) dv$$

is the probability that $u_1 - u_2 \leq Z_1'\alpha_1 - X_1'\beta_1$, that is, the probability that equation 6 does not hold and the individual does not work. The product over 1 consists of all the individuals who are working, and, for each of these, $f_{u_1, u_2'}(\cdot,\cdot)$ is the probability that the individual works and chooses the observed number of hours. L is thus the probability of drawing the observed sample, given in terms of the population parameters of interest, β_1, α, γ, σ_1, σ_2, and $\rho_{1,2}$. For the sample of ESF workers, the likelihood function consists only of the product over 1 (with u_3 replacing u_1, and u_4', defined analogously, replacing u_2'), because all ESF workers are employed. Indeed, one could just as well estimate the parameters of interest by seemingly unrelated regression to take account of the correlation between u_3 and u_4.

The variables that affect the marginal value of leisure are age, a dummy variable equal to 1 if married, nonlabor income, years of schooling, and the number of other family members 12 years or older (included as a measure of the total number of potential workers). The variables in the wage-offer function for the general population include age, years of education, the overall unemployment rate in the city of residence, and the size of the market as measured by the number economically active in the city. In lieu of price indices for each city, we include in the wage-offer function a cost factor employed by the ESF management team in setting administrative guidelines on wages paid in ESF projects. The guidelines allowed for paying higher wages where the nominal wage paid in the market was higher. Including the cost factor accounts somewhat for these differences but does not allow one to distinguish whether nominal wages are higher because the price level is higher or because the demand for labor is higher. This is

not important for the purposes of this article. Because the ESF jobs considered here are exclusively in construction, the wage-offer function for ESF jobs is made a function of the unemployment rate in the construction sector instead of the unemployment rate of the economy as a whole. All other variables in the wage-offer functions are the same. The means of all the explanatory variables for males 18 to 55 years old in the ESF sample and in the general population are presented in table 4.

As discussed above, the second model differs from the first in that it accounts for the determinants of the decision to participate in the ESF. The propensity to participate in the program, Y^*, is modeled as a function of a vector of observed exogenous variables, Ω, and a random error term, u_5. An individual participates in the ESF only if the latent participation variable, Y^*, passes a threshold. The propensity is not observable: we only observe the determinants and whether or

Table 4. *Explanatory Variables for Males 18 to 55 Years Old*

Variable	*ESF workers, mean*	*General population, mean*
Proportion working	1.00	0.61
	(0.00)	(0.49)
Weekly hours worked	50.0	29.0
	(7.00)	(25.0)
Log wage[a]	−0.03	0.13
	(0.45)	(0.78)
Wage[a]	1.07	1.11
	(0.52)	(1.10)
Variables in wage-offer equation		
Age	32.0	32.0
	(10.0)	(10.0)
Years of schooling	6.6	11.6
	(3.6)	(4.6)
Unemployment rate[b]	0.18	0.12
	(0.04)	(0.02)
Economically active/100,000[c]	2.29	1.47
	(1.76)	(1.43)
Cost factor	0.98	1.03
	(0.13)	(0.18)
Variables in hours equation		
Married (dummy)	0.73	0.59
	(0.45)	(0.49)
Other family members 12 or older	2.0	3.1
	(1.70)	(2.0)
Nonlabor income/1,000	0.003	0.042
	(0.012)	(0.14)
Sample size	452	4,185

a. For the general population, the mean log wage and the wage are calculated only for those who work. All other mean values refer to the combined working and nonworking population.

b. For the ESF workers, the unemployment rate is the unemployment rate in construction. For the general population, it is the overall unemployment rate.

c. This is an indicator of market size, measured as the number of the economically active in the city (divided by 100,000).

Source: Instituto Nacional de Estadística (1988a, 1988b).

not a worker is in the ESF, which we model as a dummy variable, I. The equations for participation are specified as

$$Y^* = \delta\Omega + u_5 \tag{12}$$

with

$$I = 1 \text{ if } Y^* \geq 0$$
$$= 0 \text{ otherwise.}$$

The variables in the Ω vector include all those in the wage-offer and marginal-value-of-leisure equations, together with the monetary value of the accumulated applications to the ESF as of the date of the survey in each capital city and a dummy variable indicating whether the individual had ever heard of the ESF. In cities where ESF applications are higher, one would expect higher participation in the ESF. The dummy variable on knowledge of the ESF is included as a proxy for information costs. If the individual has heard of the ESF, this would be expected to reduce the information costs associated with finding employment in the ESF and make it more likely that the individual would participate. It is not a perfect predictor of being in the ESF because many who were working in projects funded by the ESF had never heard of it.

Results

Because almost all ESF workers were males 18 to 55 years old, we limited our sample of the general population to males in this age group. We also excluded as outliers from both samples those who reported working more than 350 hours a month and those more than two standard deviations away from the mean n wage. The exclusion criteria reduced the ESF sample by nearly 25 percent and the Encuesta sample by 6 percent. Table 5 presents the estimated coefficients for the restricted and unrestricted models for males 18 to 55 years old in the general population. The simpler restricted model, as discussed previously, has no equation for participation in ESF and therefore implicitly assumes no correlation between errors in the participation equation and the wage offer or marginal value of leisure ($\rho_{15} = \rho_{25} = 0$). The coefficients of the variables entering the hours-of-work equations were estimated as α_1/γ_1 and α_2/γ_2, respectively. Because estimates of γ_1 and γ_2 are available, the structural parameters of the marginal value of leisure for both the general population and the ESF workers could be recovered if so desired.

In this sample, one cannot reject the hypothesis that the restrictions are valid, namely that both ρ_{15} and ρ_{25} are zero. The point estimate of ρ_{15} is negative, meaning that those more likely to participate in the ESF are, given their observed characteristics, more likely to have lower wage offers in the general population. This parameter is imprecisely estimated, however, even in this large sample. The point estimate of ρ_{25} is small and is also imprecisely estimated. The value of the likelihood function changes only slightly between the two models, and all estimated coefficients are virtually identical. Except for the estimates of ρ_{15} and ρ_{25},

all coefficients are statistically significant at the 5 percent level with the expected signs. The correlation between the error terms in the marginal value of leisure and the log wage equations (ρ_{12}) is positive, or equivalently, the correlation between the error terms in the equations for the hours of work and the log wage is negative.

Table 5. *Coefficients for the Restricted and Unrestricted Models for the Wage and Hours of Males 18 to 55 Years Old in the General Population*

Variable	*Restricted model*[a]	*Unrestricted model*
Wage-offer equation		
Constant	− 0.84*	− 0.84*
	(0.13)	(0.14)
Age	0.0073*	0.0073*
	(0.0016)	(0.0016)
Years of schooling	0.054*	0.054*
	(0.003)	(0.003)
Unemployment rate	− 3.61*	− 3.61*
	(0.56)	(0.56)
Economically active/100,000[b]	− 0.03*	− 0.03*
	(0.008)	(0.01)
Cost factor	0.75*	0.75*
	(0.08)	(0.08)
σ_1 standard deviation	0.76*	0.76*
	(0.01)	(0.01)
Hours-of-work equation		
Constant	14.0*	14.0*
	(4.0)	(4.0)
Age	0.47*	0.48*
	(0.08)	(0.08)
Married	24.0*	24.0*
	(1.00)	(1.00)
Years of schooling	− 1.70*	− 1.7*
	(0.2)	(0.2)
Other family members 12 or older	− 2.3*	− 2.3*
	(0.2)	(0.2)
Nonlabor income/1,000	−11.0*	−11.0*
	(1.0)	(2.0)
Log wage	17.0*	17.0*
	(3.00)	(4.00)
σ_2 standard deviation	2.24*	2.23*
	(0.35)	(0.35)
Correlation coefficients		
$\rho_{1,2}$	0.70*	0.70*
	(0.04)	(0.04)
$\rho_{1,5}$		− 0.43
		(0.44)
$\rho_{2,5}$		− 0.01
		(0.44)
—Log likelihood	4,508.42	4,506.72
Sample size	4,185	4,185

Note: Figures in parentheses are standard errors. * = significant at the 5 percent level.

a. Assumes no correlation in the error terms, u_1 with u_5, and u_2 with u_5 ($\rho_{15} = \rho_{25} = 0$).

b. Indicator of market size, measured as the number of the economically active in the city (divided by 100,000).

Source: Authors' calculations based on data from Instituto Nacional de Estadística (1988a, 1988b).

The estimated increase in the wage from an additional year of schooling is 5.4 percent. An increase of 1 percent in the unemployment rate would lead to a 3.6 percent decrease in wage offers. The results also indicate that those with more nonlabor income and those in families with more potential workers have a higher marginal value of leisure and will work less. An increase of Bs1,000 a year in nonlabor income decreases hours worked per week by 11. Conversely, marriage and age are associated with higher hours of work. A 1 percent increase in the wage is estimated to lead to an increase of 0.17 hours worked. At the sample unconditional mean of 29 hours, this amounts to a 0.6 percent increase in hours worked. Thus the estimated labor supply elasticity is 0.6.

Although more educated people have higher wage offers, they also have higher marginal values of leisure. Thus the effect of education on hours worked depends on the combined effect. On the one hand, an increase of one year of education increases the log wage by 0.054 which, in turn, increases hours worked by 0.92 hours. On the other hand, an increase of one year of education, acting through its effect on the marginal value of leisure, decreases hours worked by 1.7 hours. An additional year of education, therefore, is associated with a 5.4 percent higher wage in the general labor market and 0.78 hours less work a week.

Table 6 presents results of the restricted and unrestricted model for the ESF workers. Because this sample is roughly one-tenth the size of that of the general population, it is not surprising that the coefficients are estimated with less precision. Although the coefficients in the wage-offer equation follow the same pattern as for the general population and are generally precisely estimated, this is not the case for the coefficients in the hours equation. This is undoubtedly because of the much lower variation in hours in the ESF sample. Not only do all ESF workers work, but, also conditional on working, their hours vary less than in the general population.

In contrast to the case with the general population, for the ESF workers we can reject the hypothesis that both $\rho_{3,5}$ and $\rho_{4,5}$ are equal to zero. The negative $\rho_{4,5}$ indicates that those with a larger positive u_5, who hence are more likely to participate in the ESF, are those with a lower u_4, and hence a lower marginal value of leisure. This means that those individuals are more likely to work longer hours. One possible explanation is that those individuals well suited to unskilled construction work may be more likely to work in the ESF and have the stamina to work more hours. Alternatively, it may be that those more likely to work in the ESF have a higher marginal utility of income and are prepared to work longer hours. It is, of course, impossible to distinguish among alternative explanations for associations between the unobserved errors.

The estimated coefficients in the wage-offer function do not change dramatically between the restricted and the unrestricted model. As expected, given the low-skilled nature of the construction work, the return to education is only 1.6 percent—considerably lower than in the general population. The coefficients in the hours equation do change considerably between the restricted and the unre-

Table 6. *Coefficients for the Restricted and Unrestricted Models for the Wage and Hours of Males 18 to 55 Years Old in the ESF Sample*

Variable	*Restricted model*[a]	*Unrestricted model*
Wage-offer equation		
Constant	−1.70*	−1.59*
	(0.31)	(0.25)
Age	0.0086*	0.0076*
	(0.0023)	(0.0025)
Years of schooling	0.021*	0.016**
	(0.006)	(0.009)
Unemployment rate	−1.10**	−1.29*
	(0.62)	(0.52)
Economically active/100,000[b]	−0.01	0.01
	(0.01)	(0.01)
Cost factor	1.51*	1.29*
	(0.27)	(0.25)
σ_3 standard deviation	0.40*	0.41*
	(0.01)	(0.01)
Hours-of-work equation		
Constant	49.0*	20.0*
	(2.0)	(3.0)
Age	−0.01	0.01
	(0.05)	(0.05)
Married	1.0	0.3
	(1.0)	(1.0)
Years of schooling	−0.0	−0.7*
	(0.1)	(0.1)
Other family members 12 or older	−0.3	−0.6*
	(0.2)	(0.2)
Nonlabor income/1,000	22.0	−32.0
	(22.0)	(21.0)
Log wage	2.0	13.0*
	(2.0)	(3.0)
σ_4 standard deviation	4.11	1.11*
	(4.71)	(0.18)
Correlation coefficients		
$\rho_{3,4}$	0.32*	0.39*
	(0.11)	(0.16)
$\rho_{3,5}$		0.14
		(0.18)
$\rho_{4,5}$		−0.91*
		(0.02)
—Log likelihood	1,878.73	1,863.66
Sample size	452	452

Note: Figures in parentheses are standard errors. * = significant at the 5 percent level. ** = significant at the 10 percent level.

a. Assumes no correlation in the error terms, u_3 with u_5, and u_4 with u_5 ($\rho_{35} = \rho_{45} = 0$).

b. Indicator of market size, measured as the number of the economically active in the city (divided by 100,000).

Source: Authors' calculations based on data from Instituto Nacional de Estadística (1988a, 1988b).

stricted model, but, because the restricted model has so little precision, one should not make too much of the changes.

The top part of table 7 presents mean expected wage, weekly hours worked, and weekly earnings based on the estimated coefficients from tables 5 and 6.

Table 7. *Mean Expected Wages, Hours, and Earnings Based on Coefficients of the Restricted and Unrestricted Models*

Variable	Restricted model: General population	Restricted model: ESF workers	Unrestricted model, ESF workers
Conditional on working			
Wage (bolivianos per hour)	1.19	1.15	1.06
Weekly hours	35.4	50.2	49.6
Weekly earnings (bolivianos)	46.3	57.7	52.4
Probability of working (percent)	72	100	100
Unconditional			
Wage (bolivianos per hour)	0.95	1.15	1.06
Weekly hours	27.7	50.2	49.6
Weekly earnings (bolivianos)	33.3	57.7	52.4
The expected position of ESF workers without the program			
Conditional on working			
Wage (bolivianos per hour)			0.94
Weekly hours			40.1
Weekly earnings (bolivianos)			38.7
Probability of working (percent)			82
Unconditional			
Wage (bolivianos per hour)			0.80
Weekly hours			34.1
Weekly earnings (bolivianos)			34.6

Note: At the survey date 1 boliviano was worth approximately $0.50. Values are mean conditional earnings and unconditional wages, hours, and earnings, obtained by averaging over all individuals. For example, the mean conditional earnings were calculated as $\frac{1}{N}\sum_i W_i \times H_i$. This is not equal to $\overline{W} \times \overline{H}$.

Source: Author's calculations based on data from Instituto Nacional de Estadística (1988a, 1988b).

These expectations are first calculated conditional on working, and then they are multiplied by the predicted probability of working, to yield the unconditional expectations. The mean expected values are calculated for each observation in the sample and then averaged. In a likelihood ratio test of the two models of the ESF workers, the restricted model was rejected in favor of the unrestricted model at the 5 percent level of significance. Thus the expected values of the unrestricted model are the ones to focus on. Because the restricted model for the general population was not rejected, however, we present the results for the restricted model of ESF workers solely for the sake of comparison.

The mean expected wage of ESF workers, conditional on working, is Bs1.06 an hour, very close to the actual mean wage in the ESF sample. The mean expected weekly hours conditional on working is considerably higher for the ESF workers than for the general population (49.6 versus 35.4 hours). It is this difference that accounts for the higher mean expected earnings of the ESF workers (Bs52.4 versus Bs46.3 a week). Because all ESF participants work, there is no difference between their conditional and unconditional expectations. The mean probability of working for the general population is 72 percent, however, so that the unconditional expected wage, hours, and earnings of the prime-age males in the general population are correspondingly lower.

The expected position of ESF workers without the program is calculated by replacing the estimated coefficients from the ESF equations with those of the general population and recalculating the expected wage, hours, and weekly earnings. These calculations are presented in the bottom part of table 7. Both the conditional and unconditional wages of ESF workers are lower than those of the comparator population here, but they have a greater probability of being employed (even without the ESF program) than do the comparator population (82 percent) and have a higher expected number of hours worked.

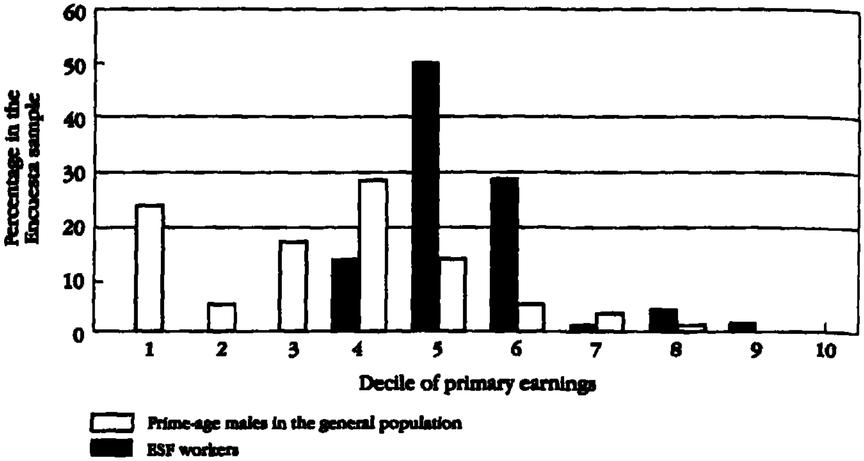
To measure the benefit from working in the ESF, we calculated the difference in expected wage, hours, and earnings for a worker in the ESF and for the worker without the ESF conditional on being employed. This enables us to look not only at the average benefit over all ESF workers, but also at the distribution of the benefits. The average ESF worker experiences increases of 13 percent in wages, 9.5 hours in weekly work, and 35 percent in weekly earnings over expected levels without the ESF. Taking into account the possibility that the individual may not have worked without the ESF leads to larger gains. The unconditional comparison indicates that, for the average ESF worker, wages are 33 percent higher, the work week is 15.5 hours longer, and weekly earnings are 51 percent higher.

An examination of the distribution of gains over all ESF workers indicates that the greatest benefits from participating in the program were received by those who would have been least well-off without the program. We define the least well-off group as those whose estimated conditional wage without the program would have placed them more than one half of a standard deviation below the actual mean wage of prime-age males in the general population. Twenty-five percent of the ESF sample consists of individuals in this group. Participation in the ESF gives this group an absolute increase of Bs0.37 an hour in their expected wage (a 64 percent increase), an increase of 20 hours worked, and an absolute increase in earnings of Bs29 a week (a 171 percent increase) over their position if they worked without the ESF. Taking into account the probability that they might not work yields corresponding absolute increases of Bs0.57 an hour, 30 hours of work a week, and Bs38 a week.

The next group of ESF workers to be considered consists of those whose estimated conditional wage without the program would have placed them within one-half of a standard deviation (plus or minus) of the actual mean wage of prime-age males in the general population. Seventy-three percent of the sample fall into this category. Because this group has higher wages and earnings than the less well-off group, their percentage gains will be smaller. Conditional on working, the absolute increases for this group are estimated to be Bs0.03 a week in wages (a 3 percent increase), 5.7 hours worked, and Bs7.4 in weekly earnings (a 15.9 percent increase). The unconditional comparison yields average increases of Bs0.15 an hour, 10.4 hours a week, and Bs16.5 a week.

A further indication of the benefits of participation in the ESF is provided by comparing the estimated wage of workers with the ESF program to the actual

Figure 3. *Estimated Earnings of ESF Workers Compared with the Actual Mean Wage of Prime-Age Males in the General Population*



Note: Decile ranges calculated from males 18 to 55 years old in the Encuesta sample.
Source: Authors' calculations based on data from Instituto Nacional de Estadística (1988a, 1988b).

mean wage of prime-age males in the general population (figure 3). With the increased wage received in the ESF program, only 6 percent of the ESF workers are estimated to be in the least well-off group (as defined above), 91 percent of the ESF workers in the middle group, and 3 percent in the highest group. The biggest effect was in moving individuals out of the least well-off category. Because ESF workers in the lowest groups also experienced the largest increase in expected hours worked, their relative benefits in weekly earnings compared with the better-off groups are even larger than their hourly wage gains.

ESF workers benefitted in terms of estimated wages and actual earnings. The ESF program resulted in a substantial temporary increase in earnings, with most of the beneficiaries moving out of the lowest deciles toward the middle deciles.

V. Conclusions

Returning to the four views of the ESF, it is apparent from the administrative records and the survey data that the ESF was more successful in fulfilling some of its promises than others. The ESF generated and rapidly disbursed external funds. To the extent that it successfully transferred these funds to lower-income groups who consume mainly domestically produced goods, the expenditure would be expected to have a larger multiplier effect. It generated substantial temporary gains in earnings of workers in the projects over what they would have received without the program, with the lowest income groups receiving the

greatest increases in earnings. Although the ESF did not target the former miners and former public sector employees that are generally considered the ones most affected by the structural adjustment program, it did employ workers that came primarily from the construction industry, which was also hurt by the economic crisis.

To a large extent, the outcomes resulted from the extensive use of existing local institutions and private subcontractors. The success of the ESF depends first on the presence of local institutions capable of preparing projects. ESF experience has indicated that this can be a problem, particularly in low-income areas, and that active promotion on the part of the management team is needed. Working with existing institutions undoubtedly contributed to the ESF's ability to generate external funds and rapidly disburse them. Once the subcontractors received the funds, it is readily apparent from the Instituto survey that they paid market wages for unskilled construction laborers. This is not surprising because the ESF did not exert control over whom the subcontractors hired, but did judge them on the progress of the project. In this respect the program differs from other temporary employment schemes that aim to be an employer of last resort by offering below-market wages. In those schemes, the quality of the infrastructure created would be expected to be lower.

By virtue of working through the subcontractors, all targeting of benefits takes place in the initial selection of projects. Because unskilled construction workers are low-income individuals, the ESF program succeeded in reaching poorer groups of families. Although these workers are certainly poor by other countries' standards, however, they are not the poorest groups or, necessarily, the groups most adversely affected by the structural adjustment program. These groups would be helped only with this type of demand-driven program if they chose to seek work in the ESF and if the private subcontractors were as willing to hire them as they were to hire more experienced construction workers. It was also to be expected that some subcontractors, faced with the need to meet performance standards on the quality of the projects, would hire workers who were already employed in the construction sector.

The administrative success of the ESF as a temporary financial institution generated interest in replicating the central ideas more permanently and as part of a compensation package in a structural adjustment program. The program's use of private subcontractors was seen to rapidly generate temporary benefits to a mostly low-income group with low administrative costs. The likely effects of a similar program in other countries depends on labor market conditions, the administrative capability of existing ministries, and the strength of local governmental and nongovernmental organizations. For example, a demand-driven program such as the ESF is unlikely to have much effect on unemployment resulting from educated youth waiting for a job in the modern sector. The program is more likely to be a success if there are projects promising high returns using low-skilled workers, if there is unemployment in the construction sector and construction workers are at the low end of the income distribution, and if

paying below-market wages is considered undesirable—either because of the potential impact it could have on the quality of the project or because of the administrative costs of monitoring to ensure that low wages are actually paid. If these conditions prevail, as they did in Bolivia, then this type of temporary employment scheme may be a viable alternative to programs in which the government directly hires workers.

APPENDIX

The second model consists of five equations that describe (a) participation in the ESF, (b) wage offers in the general population, (c) the marginal value of leisure of individuals in the general population, (d) wage offers in the ESF, and (e) the marginal value of leisure of ESF workers. If participation in the ESF were simply a function of the relative wage offers between the ESF and the general labor market, there would have been no need to include a separate participation equation. But because work in the ESF differs along other dimensions—for example, it offers full-time work over a short period—a separate participation equation was included.

Participation in the ESF is modeled with a latent variable structure. An individual participates in the ESF only if the latent variable passes a threshold. Thus, we specify:

$$\text{(A-1)} \qquad \begin{aligned} Y^* &= \delta\Omega + u_5 \\ I &= 1 \text{ if } Y^* \geq 0 \\ &= 0 \text{ otherwise} \end{aligned}$$

where I is a participation indicator, Ω is a vector of exogenous variables affecting the participation decision, δ is a vector of coefficients to be estimated, and u_5 is a random error term. In this and all other equations, the subscripts pertaining to the individual have been suppressed.

The underlying latent variable Y^* is not observed. We observe only I, whether the individual participates in the ESF or not.

The wage-offer and marginal-value-of-leisure equations are the same as in the text (equations 1–4). The error terms (u_1, u_2, u_3, u_4, u_5) have a multivariate normal distribution with the following covariance structure:

$$\begin{bmatrix} \sigma_{11} & \sigma_{12} & 0 & 0 & \sigma_{15} \\ & \sigma_{22} & 0 & 0 & \sigma_{25} \\ & & \sigma_{33} & \sigma_{34} & \sigma_{35} \\ & & & \sigma_{44} & \sigma_{45} \\ & & & & \sigma_{55} \end{bmatrix}.$$

Because participation is a zero-one decision, it is not possible to separately identify δ, the coefficients in equation 1, from σ_1. Following the usual practice, we normalize σ_5 to be equal to 1. The covariance among errors in the wage-offer and marginal-value-of-leisure equations of the general population, on the one

hand, and among corresponding equations of the ESF (σ_{13}, σ_{14}, σ_{23}, and σ_{24}), on the other hand, cannot be estimated because the individual works either in the ESF or in the general labor market. Thus they are set to zero. Errors in the wage-offer and marginal-value-of-leisure equations in the general population are allowed to be correlated, thereby picking up measurement error between hours and wages. Similarly, errors in the wage-offer and marginal-value-of-leisure equations in the ESF population are allowed to be correlated.

The main difference between this model and the simpler one in the text is that in the text the implicit assumption is made that errors in the equation determining participation in the ESF are uncorrelated with wage offers and marginal values of leisure both in the ESF and in the general population, that is, $\sigma_{15} = \sigma_{25} = \sigma_{35} = \sigma_{45} = 0$. Under these assumptions, the multivariate normal distribution of the errors collapses to the product of independent distributions:

$$f(u_1, u_2, u_3, u_4, u_5) = f(u_5) \cdot f(u_1, u_2) \cdot f(u_3, u_4). \quad \text{(A-2)}$$

Thus in the first model one may estimate the wage offers and marginal values of leisure in the ESF independently of the participation decision or of the wage-offer and marginal-value-of-leisure equations in the general population.

To allow for the possibility that ESF workers could differ in some unmeasured characteristics from those in the general population, we relax the covariance restrictions of the simpler model. Under a more general covariance structure, those individuals more likely to participate in the ESF could have higher or lower wage offers than the general population. Under the less restrictive assumptions, the distribution of multivariate normal errors is:

$$f(u_1, u_2, u_3, u_4, u_5) = f(u_5) \cdot f(u_1, u_2 | u_5) \cdot f(u_3, u_4 | u_5). \quad \text{(A-3)}$$

In the previous case, $f(u_1, u_2 | u_5)$ was assumed equal to $f(u_1, u_2)$ and $f(u_3, u_4 | u_5)$ equal to $f(u_3, u_4)$. Because this is no longer the case, we now must consider the participation decision in order to arrive at the expected wages and earnings of ESF workers without the program. We estimate this model in two steps.

In the first step, we predict the probability that a prime-age male would work in the ESF. Our problem is complicated by having to estimate the participation decision with a combined sample of ESF and Encuesta survey observations, with an overrepresentation of ESF workers. We know that those individuals taken from the ESF sample were program participants. Although there may be some unidentifiable ESF workers in the Encuesta sample, their proportion is so low that we assume their presence does not affect the distribution of workers in the population in any significant way. Thus we consider the Encuesta sample to consist of nonparticipants in the program.

In combining information from the two samples, it is important to recognize that the ESF workers must have chosen to work in the ESF projects at least in part because they viewed that work as preferable to their alternatives. Because the two samples are not distinguished solely on the basis of an exogenous variable

such as age, but rather on a choice that was made, we face the problem of analyzing the participation decision using a choice-based sample (see Manski and McFadden 1981, and Amemiya 1985, pp. 319–38). Because we know the size of the ESF program in each of the capital cities, however, we can follow the weighted likelihood function approach of Manski and Lerman (1977) in estimation. In this approach, one weights the log likelihood pertaining to the outcome of each group by the ratio of the probability of encountering a member of a particular group in the population to the probability of drawing a member of that group from the sample.

In the second step, by virtue of the independence of the error terms in the ESF and general population conditional on the participation error $f(u_1, u_2 | u_5)$ and $f(u_3, u_4 | u_5)$ we can work with the ESF sample separately from that of the population. For the general population, we need to modify the likelihood function given in equation 11 in the text by replacing the bivariate density function $f(u_1, u_2')$ with the conditional bivariate density function $f(u_1, u_2' | u_5)$. The conditional density function is bivariate normal, with

$$\text{(A-4)} \qquad f(u_1, u_2' | u_5) \sim N[\rho_{15}\sigma_1 u_5, \rho_{25}\sigma_2' u_5, \sigma_1^2(1 - \rho_{15}^2), \sigma_{2'}^2(1 - \rho_{25}^2), \rho]$$

where

$$\rho = \frac{\rho_{12} - \rho_{15}\rho_{25}}{\sqrt{(1 - \rho_{15}^2)}\sqrt{(1 - \rho_{25}^2)}}.$$

Because the conditional means depend upon u_5, the error term from the participation equation will enter the likelihood function. Because u_5 is not observed, however, it must be integrated out of the likelihood function over its relevant range. From equation A-1, for those who don't participate in the ESF, $u_5 < -\delta\Omega$. Thus the relevant range for u_5 is from $-\infty$ to $-\delta\Omega$. The resulting likelihood function for the general population will now be:

$$\text{(A-5)} \qquad L = \prod_0 \int_{-\infty}^{-\delta\Omega} f_{(u_1, u_2' | u_5)}(v) \cdot f(u_5)\, dv\, du_5$$

$$\prod_1 \int_{-\infty}^{-\delta\Omega} f_{(u_1, u_2' | u_5)}\left(\ln w - X_1\beta_1, H - \frac{1}{\gamma_1}\ln w + Z_1\frac{\alpha_1}{\gamma_1}, -\rho_{1,2}\right) f(u_5) du_5.$$

As in the estimation of the ESF sample in the simpler model, only the second part of the likelihood function given in equation A-5 would appear for the ESF equations, with u_3, u_4 substituting for u_1, u_2. Because the condition for workers to participate in the ESF is $u_5 > -\hat{\delta}\Omega$, the limits of integration of u_5 for the ESF workers are from $-\hat{\delta}\Omega$ to ∞. If ρ_{34} were equal to zero, this estimation procedure would be exactly equivalent to Heckman's (1979) two-step procedure of including the estimated value of the Mills ratio as a regressor on single-equation ordinary-least-squares regressions of $\ln w_{ESF}$ and H_{ESF}.

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The Impact of Changes in Job Security Regulations in India and Zimbabwe

Peter R. Fallon and Robert E. B. Lucas

Employment laws in India and Zimbabwe require employers to obtain permission from the government to retrench or lay off workers. The effect of these laws on the demand for employees in 64 manufacturing industries is examined using time series data. Little evidence is found indicating slower adjustments in employment levels and hence retardation in any structural adjustment following the new laws. However, in both countries a substantial decline in the demand for employees (other things equal) followed the new legislation. In Zimbabwe it is difficult to be precise about a causal connection between the drop in the demand for labor (allowing for concurrent increased wages) and the new legislation because enactment occurred simultaneously with Independence; however, the current economic climate induced high levels of investment in capital but not investments in long-term commitments to employees. But in India further evidence supports a causal connection: larger establishments covered by the job security regulations tended to experience a decline in the demand for labor while smaller, uncovered enterprises in the same industries did not; moreover the decline in demand for employees across industries in India was larger where the private sector predominates, where larger establishments covered by the new laws are important, and where a smaller proportion of employees are union members. Thus in both countries the policy implemented to protect jobs may have resulted in far fewer jobs.

Upon achieving independence in 1980, the government of Zimbabwe passed a new Employment Act, requiring employers to obtain permission from the Ministry of Labor to fire or lay off workers. Comparable regulations were imposed in India by the Industrial Disputes (Amendment) Act of 1976, requiring that written permission be obtained, normally from the relevant state government, either to close a plant or to retrench workers. The immediate goal of these items of legislation was to protect the livelihood of workers and to maintain jobs.

Any addition to economic security in the lives of workers is clearly a laudable goal in its own right. But the question addressed in this article is whether these particular job security regulations have had undesirable side effects, which may even have thwarted the original goals of the legislation. India and Zimbabwe are

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not alone in imposing permission requirements for retrenchment, although their laws are among the most stringent in the world. These two countries were selected for analysis because of this extremity, combined with the availability of high-quality industrial data.

In very broad terms one might expect that making jobs more secure would make employers less able to make rapid adjustments to changing market conditions. But, in addition, restricting employers' ability to fire workers may actually reduce the size of the work force employers wish to maintain. In turn, these two elements may have much wider ramifications, such as retarding structural adjustment, promoting greater capital intensity, and influencing the mix of evolving industries. These wider ramifications lie beyond the scope of this article, which focuses more narrowly on the employment effects.

To understand these employment effects and their potential importance, some relevant features of the labor markets in each country are briefly discussed. The coverage and enforcement of the job security legislation are then discussed, and the potential effects of such regulations are outlined in general terms. Time series data are used to estimate the magnitude of the new laws' impacts on employment in a wide range of manufacturing industries and to examine some of the factors that influence why some industries appear to be more affected than others.

I. The Indian and Zimbabwean Labor Markets

Recently evolved employment and institutional factors are likely to have affected the wage determination process in India and Zimbabwe.

India

Industrial employment in India has grown very slowly despite massive investments (Lucas 1986, 1988). By 1980 total employment in the manufacturing sector remained below 6 million. The relative share of the public sector in manufacturing employment has grown steadily, from 14.8 percent in 1966 to 25.5 percent in 1982, reflecting in part the dominant role of public sector investments. During the 1980s some limited liberalization of Indian industry has been permitted, and growth in industrial production has been significantly more rapid, but employment in the factory sector has declined slightly since 1982.

Industrial wages have grown significantly relative to the consumer price index for industrial workers. However, this wage growth does not appear to have been the result of a healthy, tight, overall labor market. The wages of agricultural workers have hardly risen relative to the consumer price index for agricultural workers. Thus a distinct dualism seems to characterize the Indian labor market.

One reason that industrial wages remain well above those for agricultural workers in India is the existence of a complex structure of minimum wage laws,

which vary from state to state and across industries and occupations within states. Although enforcement of these laws may vary a good deal, they seem to have a greater impact on the industrial sector than on agricultural laborers. But perhaps an even more important reason that industrial wages are higher has been the dramatic rise in union membership and militancy. Union membership increased by more than 150 percent between 1966 and 1979, and twice as many work days were lost in strikes in the 1980s as in the second half of the 1960s.

The future growth of industrial employment in India is likely to prove crucial to overall living standards and to the distribution of income. One of our key concerns therefore is to examine the effects that the job security provisions in the 1976 amendment to the Industrial Disputes Act have had on industrial employment. Industrial employment and how it has been influenced by public sector employment and workers' unions are also examined.

Zimbabwe

From Zimbabwe's Unilateral Declaration of Independence in 1965 until the first oil shock in 1974, gross domestic product (GDP) grew rapidly; it averaged 7.5 percent growth annually as import substitution proceeded. Meanwhile overall employment grew somewhat less quickly at about 3.7 percent a year, with growth in manufacturing employment leading the way at 7.2 percent. After 1974 the burgeoning civil war, emigration of whites, limited material access under trade sanctions, drought, and high oil prices helped to generate a recession in which overall GDP actually declined slightly from 1974 to 1979. Overall employment also fell in this interval, with employment declines in both agriculture and manufacturing.

From 1965 to 1979 the labor market treated Africans quite differently than Europeans, although systematic data are not available for much of the period. Skilled jobs, apprenticeships, and better education were largely reserved for the Europeans. Whereas a few unions existed for Europeans, only a negligible number of Africans were able to organize. The latest year for which data on earnings by race seem to be available is 1978, at which time the overall annual earnings of Europeans were some 10.4 times greater than those of African employees, the ratio being 7.3 in manufacturing and 24.5 in agriculture (Fallon 1987a). Real consumption earnings (annual earnings per employee deflated by the consumer price index) barely increased in manufacturing during the 1970s. The failure of real wages to rise, the decline in employment in the second half of the 1970s, and the wage differences for Africans and Europeans had a major impact on the attitude of the new government that came into power upon Independence in 1980.

Minimum wage laws played a key role after Independence. The minimum wage relative to the consumer price index was raised by 27 percent in industry and mining and by 43 percent in agriculture in the first 18 months after Independence. Wage scales have been deliberately compressed through the incomes

policies of employment boards and councils, in an attempt to reduce the extent of inequality. Unions have grown rapidly in size and coverage, although the union movement clearly started from a tiny base in 1980.

With the removal of sanctions upon Independence, the Zimbabwean economy experienced a brief boom, with 9.1 percent GDP growth from 1979 to 1982. However, agriculture and manufacturing have been stagnant or in decline since 1981. The initial growth, the dramatically rising minimum wage rate, and perhaps also the enhanced unionization resulted in a growth in real earnings in the first couple of years after Independence. The rapid rise in nominal earnings was overtaken in 1983 and 1984 by an even more rapid inflation in consumer prices.

Overall employment has expanded since Independence; by 1984 total employment had rebounded to its 1974 level. Much of the new employment is in public administration and teaching; employment in agriculture remains lower than at any time in the previous two decades (partly as a result of drought), and manufacturing employment declined after the 1982 peak.

The population grew at an average annual rate of 3.3 percent from 1970 to 1980. The fact that employment in 1984 stood only at the 1974 level implies a growing problem of unemployment. The 1982 population census estimates an open unemployment rate of 18.5 percent for the labor force, excluding communal farmers, and this rate has almost certainly increased since that time. Concern over this unemployment problem has played a major role in shaping the job security provisions of the Employment Act.

II. Job Security Regulations in India and Zimbabwe

Many countries legislate certain steps to be followed when a worker is dismissed. Most typically these steps include a minimum period of notice or a formula for separation compensation (such as a fixed sum, some proportion of current pay, or an amount tied to length of service). In neither India nor Zimbabwe are these provisions particularly onerous by international standards. According to India's Industrial Disputes Act of 1947, in the event of retrenchment a factory worker with more than 240 days of service is entitled to one month's notice in writing, stating the reasons for retrenchment, and 15 days' compensation for each year of service at 50 percent of basic wages plus dearness allowance (a payment linked to inflation). In Zimbabwe the required period of notice is between one day and one month, depending on the periodicity of pay and length of service, while the only legislated severance pay is for the period of notice.

The job security provisions in India's and Zimbabwe's labor laws differ from those of most other nations because of their permission requirement. The 1976 amendment to India's Industrial Disputes Act of 1947 makes "lay off retrenchment and closure illegal except with the prior permission of the Government" (India, Government of, 1978, p. 303). The 1980 Employment Act of Zimbabwe

also requires that explicit permission be obtained from the government before any worker may be dismissed or laid off. Although similar in specifying the need for government permission, the coverage of these laws differs, and the restricted coverage in India will prove important to our subsequent analysis.

Coverage of the Regulations

The permission requirements in India's 1976 amendment covered all industrial establishments employing more than 300 workers on an average day in the 12 months before the amendment. (An exception was made for establishments which are specifically seasonal in character or in which work is performed only intermittently.) Subsequently a 1982 amendment extended coverage to establishments with 100 or more workers. Whether these provisions are constitutional has been challenged in a series of court cases on the principle that the right to be in business also implies the right to get out of business. The 1982 amendment and a further amendment in 1984 appear to have remedied some of the specific legal criticisms, and the latter amendment currently stands, although it is still being contested in the courts. The penalty for retrenchment or closure without permission includes both a prison sentence and a fine for the employer. The legislation does make an exception for retrenchment resulting from power shortages or natural disaster. Moreover *badli*, or casual workers, are not covered by either the compensation formula or the permission requirements, which apply to permanent workers (those paid for 240 days or more in a year).

The permission requirements in Zimbabwe's 1980 Employment Act cover all undertakings, industries, and occupations. The only exceptions are for officers of Parliament, unpaid workers in charitable institutions, and university students performing jobs required as a part of their curricula. The 1980 act was clarified and extended in three statutory instruments in 1981, 1982, and 1985. But these clarifications have served largely to reaffirm government commitment to the permission requirement and to define penalties for wrongful dismissal (currently amounting to reinstatement of the worker with back pay, a fine not exceeding Z$2,000, and up to 12 months in prison for the employer). Even fixed-term contract workers are fully covered by Zimbabwe's permission clause. Casual workers, who may be employed no more than six weeks in any three-month period, are excluded from any permission requirement upon separation.

Implementation

In India it seems that no appropriate government body has yet granted permission either for closure or retrenchment within the stipulated period. Consequently plant closures in particular are frequently appealed in the courts, whose proceedings can be extremely protracted. Mathur (1989) notes that the number of plant closures diminished during the 1980s and suggests that the difficulty in obtaining permission for closure may have been a factor in this reduction. However, many employers seek alternative routes to retrenchment:

> *More vigorous de-manning approaches have involved "lock-outs," virtually generated in the hope that a prolonged cessation of operations will* lead to separations more easily. In pursuit of de-manning, employers are known to have deliberately brought factories to a grinding halt on the plea of lack of power supply (achieved through nonpayment of electricity bills) or raw materials (Mathur 1989, p. 175).

Applications for permission to retrench a Zimbabwean worker are deliberated by the Retrenchments Committee in the Ministry of Labor. The Committee hears evidence from all concerned parties and then makes a recommendation to the minister. This process can be quite drawn out, and some applications take as long as a year to review. Moreover rulings generally recommend that some alternative solution be sought by the employer, rather than granting permission for actual retrenchment. Certainly implementation in Zimbabwe has been such that in an attitudinal survey of enterprises, the dismissal regulations were cited as one of the leading concerns among employers (Hawkins and others 1988).

In both countries the lack of coverage for temporary workers provides an obvious temptation to rely on such workers, but in both countries there are forces that militate against this route. In general temporary employees acquire less specific training and also lack the incentive to work hard. These forces are strengthened in India with the active and effective opposition of the unions to casualization of the work force and in Zimbabwe by a provision that all casual labor must be paid at least twice the going minimum wage.

The one situation in which permission is not required for separation in either country is when both parties agree to the termination of employment. Naturally, this opens the possibility of paying workers to quit or retire voluntarily. Indeed this practice seems commonplace throughout the formal wage sector in both nations and clearly represents the main escape clause available. But this method of escape can be quite expensive for the employer. Not surprisingly, there is considerable variation in the minimum offer necessary, depending on qualities of the individual and general labor market conditions, as well as on the incidence of collective bargaining. In India packages offering one month of pay for each year of service are not uncommon, although incidents of far higher offers have also been recorded. In Zimbabwe the going settlement is reportedly around eight months of pay (Fallon 1987a, 1987b; Mathur 1989).

III. Potential Effects of Job Security Regulations

Whenever a firm's labor force changes, some costs in making adjustments are inevitable. On the hiring side certain components of these costs are apparent—the costs of attracting a pool of applicants, the costs of screening the applicants either before appointment or during an initial trial phase, and the costs of training. On the firing side costs may also be incurred. For example, if any worker possessing firm-specific skills quits, this typically imposes a net loss on the firm. Moreover, even without legislated requirements, firms may voluntarily

choose to enter a contract with their employees that promises severance pay. Such an arrangement can be profitable for the firm if workers are concerned with the risks of being laid off and hence are willing to accept a job paying a lower wage combined with promises of security or with financial compensation in the event of dismissal. In essence the reduced wages can be considered an insurance premium payment toward a claim in the event of job loss.

These various costs of adjusting one's labor force generally mean that employment decisions by firms become dependent not only on market conditions today but also on anticipation of future labor needs. Thus a firm will be reluctant to hire during a market upturn if it anticipates significant costs in again reducing the work force during a subsequent downturn. These ideas are well developed in the theory of dynamic demand for labor (Nickell 1986).

What is far less well developed in the literature is any analysis of the consequences of legislated intervention to provide job security, such as that in India or Zimbabwe. What are the potential consequences of imposing job security legislation when a voluntary arrangement has already been struck between employers and employees? It will be useful to distinguish at least four potential consequences; the first and second may affect the demand for employees directly, and the third and fourth may do so indirectly through their potential effects on wages and hours of work.

First, the greater the costs and obstacles are to adjusting the work force, the less flexible a firm is in reacting to changing market conditions. Thus the standard approach to adjustment costs in the existing literature focuses almost exclusively on the speed with which firms will change their levels of employment. In the extreme, if firms had to rely entirely on voluntary quits and retirements, the speed in adjusting employment levels may be severely retarded. If firms must incur additional costs in persuading workers to quit or retire, then the speed at which firms adjust their labor force to changing conditions may tend to be diminished by the additional job security regulation.

Second, the level of employment—not merely its speed of adaptation—may be affected by job security provisions. This may be true because the ability to fire workers may be an important aspect of maintaining worker productivity. It is common to apply on-the-job evaluations in the normal process of screening for more effective workers. If denied this capacity, firms will be stuck with workers who prove to be poor matches with the specific demands of the job, thus reducing overall productivity. In addition, if the job security regulations encourage the use of temporary laborers, as is certainly true in India, again productivity will generally decline since temporary workers acquire less firm-specific skills. Thus additional job security imposed on employers, who may already voluntarily be offering some degree of job security precisely because more permanent workers are more productive, may diminish worker productivity.

Even if a firm wishes to maintain a constant overall level of employees, labor adjustment costs affect the firm's employment decisions. There will be turnover in the specific composition of individuals comprising the steady number of employees because of quits and retirements, dismissals for disciplinary purposes,

and the process of on-the-job screening. Again, the effect of raising the cost of such adjustments in work force composition is to raise the cost of employing a given level of employees.

The effects of job security regulations on labor productivity have ambiguous effects on the demand for employees, but enhanced turnover costs do not. By raising turnover costs, and perhaps by lowering productivity, job security regulations may thus act as a tax on employment, effectively raising the cost of labor (Stiglitz 1974). Job security regulations would then tend to encourage adoption of more capital-intensive production techniques, to shift production away from more labor-intensive processes, and hence to reduce the demand for labor.

Thus the two direct potential effects of job security regulations on the demand for employees are a slower ability to adjust and an altered level of demand, which will tend to be lower unless substitution effects from lower productivity dominate. These two components will be examined empirically in section V. Other potential effects, such as changing the skill mix of employees and smoothing production through inventory fluctuations, are not examined here owing to the lack of appropriate data.

A third potential consequence of imposing job security legislation is that employers may generally be able to reduce the attractiveness of other contract features and still obtain workers of the same caliber. Thus one might expect that the imposition of greater security might lead to lower wages. Hamermesh (1988) explores the connection between the reservation wage and the probability of plant closure in the United States. In India this tendency may be thwarted by the combined influence of union wage bargains and minimum wage laws and in Zimbabwe by the latter alone. However, unions often bargain over a package of terms that includes both job security provisions and pay terms. The inability of employers to dismiss striking workers may actually strengthen the bargaining position of unions and insider workers more generally, which could result in an enhanced overall reward package including both greater job security and higher pay. Moreover not all workers earn only the minimum wage. Workers who earn more than the minimum may accept somewhat lower wages in exchange for the enhanced security. Lower wages could enhance the demand for employees, offsetting any direct consequences of additional job security in reducing labor demand.

To the extent that job security regulations raise the cost per employee, the fourth potential consequence might be longer hours per employee and less reliance on expanding staff levels. Rising costs of overtime combined with diminishing productivity from additional hours per employee mean that such substitutions are typically not costless.

IV. The Data

The chief source of the data on India is the *Annual Survey of Industries*, which covers two sets of factories. The census sector factories comprise all units em-

ploying 50 or more workers and using power and those employing 100 or more workers without power. The sample sector comprises all remaining units employing 10 or more workers with power and those employing 20 or more workers without power. The census sector annual data cover 1959/60 through 1981/82 (except for 1972/73). These data encompass essentially the entire census manufacturing sector disaggregated to 36 industries. A second data set covers a subset of 23 more narrowly defined industries, with separate observations on the census and sample sectors within each industry from 1973/74 through 1981/82. Since the 1976 amendment in India covered only establishments with 300 or more workers, the sample sector is uncovered by this amendment, whereas a portion of the census sector is covered, which offers an important control for testing in this second data set.

For Zimbabwe the chief source of data is the annual *Census of Production* from 1960/61 through 1984/85, which covers all industrial establishments except those with very tiny levels of output. (In 1983/84 the cutoff for establishments in the census was a gross output of Z$2,000—approximately US$1,800.) The scope of this census combined with the availability of price information confine the analysis to the manufacturing sector disaggregated to 31 manufacturing industries.

V. Empirical Evidence

The evidence amassed from these data will be discussed in three steps: the potential effects of the new job security regulations on wages and hours of work, their effects on the demand for employees, and the variations between industries in the estimated effects.

Wages and Hours of Work

Did the introduction of the job security regulations lead to less attractive terms in labor contracts and to diminished average wages in particular? The issue is whether firms can attract workers at a lower wage after the additional security is imposed. If they can, then the supply wage of workers is reduced.

A wage equation is therefore estimated in which the supply wage is measured by wages relative to the consumer price index. Real wages today are expressed as a moving average of real wages in the previous two years, plus any shift in wage patterns following the 1976 amendment in India and the 1980 Employment Act in Zimbabwe. The real wage terms are expressed in logarithms, and each equation is corrected for first-order serial correlation, by the Cochrane-Orcutt technique for India and by the Beach-McKinnon method for Zimbabwe. A different approach is needed for India because of the gap in the time series for 1972. Similar wage equations were also estimated based on a simple trend rather than a moving average, although results with respect to the job security dummy coefficient were essentially the same as those discussed in the text.

This equation is estimated for 36 industrial sectors in India and 31 in Zimbabwe. A significant drop (at the 10 percent significance level) in the movement of wages with the imposition of the job security regulations is observed only in three Indian industries—tobacco products, fertilizer, and miscellaneous chemicals. Thus there is insufficient evidence to suggest that employers were able to offset the effects of the new regulations by offering lower real wages. Instead the estimated shift in real wages is positive in most sectors. This finding would be consistent with the theory that enhanced job security endows insiders with greater bargaining strength, thus enabling them to achieve higher wages. However, whether or not this is the case cannot be discerned from this simple analysis.

It is not surprising that for India and Zimbabwe there is no evidence that employers offer lower wages when they are obliged to provide greater job security. In India, in addition to the prevailing minimum wage legislation, the growing power of the unions may well have confounded any downward pressure on wages. In Zimbabwe the contemporaneous sharp rise in the minimum wage rate and a more active role for wage boards have probably helped to prevent any downward adjustment in wages.

With respect to hours of work, our analysis is confined to India because no data are available for Zimbabwe. Hours of work are regressed on a simple trend, with a dummy variable representing the new regulations and a lagged dependent variable. (Hours of work per employee are expressed in logarithmic form in these equations, and adjustment for serial correlation is again by the Cochrane-Orcutt method.) In 3 of the 36 industries a significant rise in hours is found following the 1976 amendment, but in three others a significant drop is found. In the remainder no significant departure from trend is estimated. Thus there is no systematic evidence to suggest that the new regulations in India simply caused employers to substitute longer hours for fewer workers. This is not altogether surprising, since hours of work and conditions for overtime are very highly regulated.

In sum, there is no evidence to suggest that employers in either India or Zimbabwe were able to offset any consequences of the new legislation simply by offering lower wages or by substituting longer hours to maintain overall labor input.

The Demand for Employees

In examining the direct effects of job security regulations on the demand for employees, our approach hinges on three main elements. First, if the costs to a firm of adjusting its labor force rise with how rapidly the transition is made, then changes will tend to occur more slowly and today's employment decisions will be strongly influenced by the inherited employment level from yesterday. If the new job security regulations impose even higher costs for rapid changes, we might expect to see an increase in the inherited effect. Second, higher adjustment costs may reduce the firm's demand for employees. Consequently the new regu-

lations may actually result in diminished employment. Third, today's employment decisions are influenced by expectations about the future, which we suppose are shaped by the recent past.

Industry labor demand equation. These three elements are expressed in the following equation for the demand for employees within a given industry:

$$(1) \quad N = [\beta + \alpha J + \Sigma\omega_\tau W_{-\tau} + \Sigma\gamma_\tau Q_{-\tau} + \Sigma\Psi_\tau H_{-\tau}][1 - \lambda_0 - \lambda_j J] + \lambda_0 N_{-1} + \lambda_j J N_{-1}$$

where N is the logarithm of the number of employees, W is the logarithm of the wage rate deflated either by net producer price or the price of fuels, Q is the logarithm of output, H is the logarithm of shifts worked per employee, J is a dummy variable reflecting the imposition of the job security regulations, and $\beta,\alpha,\omega,\gamma,\psi$, and λ are the regression coefficients to be estimated. The subscript -1 indicates values in the previous year, and subscript $-\tau$ indicates values lagged τ years.

Even before the job security regulations were imposed, there were costs associated with rapid adjustment of the size of the work force. Those costs may have resulted in some sluggishness in changing employment levels. This would be reflected in a positive coefficient (λ_0) on the lagged dependent variable.

If the job security regulations raised the cost to a firm of quickly changing the level of employment, then the change in employment levels should prove even slower following enactment of the new laws. In the equation this is represented by the coefficient (λ_j) on the interaction between the lagged dependent variable and the dummy variable (the latter is set equal to one following enactment of the job security laws). If the costs of rapid adjustment have been raised, then this coefficient should prove positive.

The new regulations might have increased the effective cost of employing a given level of employees, rather than the costs of rapid adjustment. Such an escalation in costs should be reflected in a decline in the firm's desired level of employment, thus resulting in a negative coefficient (α) on the job security regulation variable.

Both current and previous values may generally be included for the real wage terms, for output, and for shifts worked. One should expect a negative coefficient (ω_0) on the current real wage and a positive association between today's output and labor demand (γ_0). However, hours of work and numbers of workers may be either complements to or substitutes for each other. Moreover the values to be expected for coefficients on all past values ($\omega_{-\tau}$, $\gamma_{-\tau}$, and $\psi_{-\tau}$) depend critically on the manner in which expectations are formed.

Estimation results. The equation was estimated for 35 industries in India and 29 in Zimbabwe. For the steel industry in India and the motor vehicles industry in Zimbabwe, no plausible estimate of a labor demand equation could be obtained over a wide range of alternative specifications explored. For the

Zimbabwean basic metals industry, it proved difficult to obtain convergence to a stable specification, so no results were obtained.

In 45 of the 64 industries for which the equation was tested, at least one lagged term proves directly to affect the current demand for labor in a statistically significant manner. Thus, at least a comparatively simple, adaptive process of expectations formation indeed seems relevant in shaping the demand for employees.

But this does not imply that today's employment levels are unaffected by wages and output levels further back than one or two years. In more than half of India's industries and in most sectors in Zimbabwe, the estimated coefficient associated with the lagged value of the dependent variable proves significantly positive. In other words, even before the new permission clauses were imposed, employers in many industries were reluctant to adjust rapidly firm employment levels under varying market conditions. Presumably this was because such speedy adjustments were costly. Since today's employment is thus affected significantly by last year's employment for these sectors, the entire history of the industry has at least some influence on today's demand for employees.

It seems that rapid adjustments in employment levels were costly even before the new permission clauses were enacted. The coefficient on the interaction between the job security dummy and lagged employment is found to be statistically indistinguishable from zero in most sectors. But this does not imply that the new regulations had little or no effect on labor demand. Our attention is drawn to the effect of the job security provisions on employers' desired level of employment, instead of on alterations in how rapidly employers adjusted the size of the work force.

The quantum shift in employers' desired level of employment is represented by the coefficient on the job security dummy. This estimated coefficient proves negative in 53 of the 64 industries. In statistical tests in which a time trend is appended to each equation, this quantum drop does not appear to be a consequence of a more general downward trend in demand for employees. In 45 out of the 53 cases this negative effect is statistically significant at a 75 percent confidence level; in half of the cases it is statistically significant at a 90 percent confidence level. This estimated coefficient proves positive in only 4 industries at a 25 percent significance level.

Additional evidence from India. Thus far all of the results for India refer to factories within the census sector (that is, factories with power employing 50 or more workers or without power employing 100 or more workers). However, the 1976 amendment imposed a permission requirement for retrenchment and closure only for factories having 300 or more employees. It has been demonstrated that within the census sector there was indeed a significant drop in employment in many industries. Thus declines within factories employing more than 300 employees were not completely offset by expansion in census sector factories

with less than 300 employees. But declines in the census sector may have been compensated for by expansion of activity and employment in smaller factories lying outside the census sector. To test this, the labor demand equations are examined with data from both the census and the sample sectors. This additional step enables us to explore whether the drop in census sector employment may have resulted from unobserved elements that might also have caused a decline in employment within the sample sector.

The data on 23 comparable census and sample sectors are limited to nine years, covering 1973/74 through 1981/82. It was necessary to combine observations on any given industry from the census and sample sectors for estimation. Thus there were 16 observations on each industry, after omitting one observation from the sample and one from the census sector to allow for a one-period lag. The specifications adopted are similar to those in equation 1, although the job security dummy is suppressed for the sample sector to reflect the fact that these smaller enterprises were not covered. The specifications permit the smaller establishments in the sample sector to have a different intercept (by means of a sample sector dummy). All other coefficients are constrained to be the same in the census and sample sectors within an industry, although there are too few degrees of freedom to conduct Chow tests on whether pooling is appropriate.

The quality of the sample sector data is clearly inferior to that for the census sector. This fact, plus the constraint required in pooling, meant that plausible estimates of the labor demand equations could not be obtained for 12 of the original 35 pooled sectors identified in our data set (for example, if positive wage terms proved stable over a wide range of specifications).

In the resulting estimates negative coefficients are again found on the job security dummy in all but four instances. In half of the negative cases the effect is statistically significant at at least a 90 percent confidence level, and in no case is the coefficient significantly positive even at a 25 percent significance level. The job security dummy is set equal to one only for census sector observations after the 1976 amendment. If a similar job security dummy for the sample sector during the same time period is also inserted into the equations, the associated coefficient proves insignificantly different from zero at a 90 percent confidence level in all but three industries. Of these latter three industries, a significant negative coefficient is obtained in one case and a significant positive coefficient in the other two. However, in none of these three industries is a significant fall in employment associated with the job security dummy for the census sector.

Thus no evidence is found to suggest that job loss in the census sector as a result of the 1976 amendment produced job gains in parallel sample sector factories through transfer of workers across establishments, through subcontracting, through putting out of work, or through major adjustments in establishment size. Nor does this evidence suggest that the significant drops in census sector employment were a result of spurious industry developments, which also caused drops in the parallel sample sector factories.

Possible causes of the drop in employment in Zimbabwe. In Zimbabwe a question might arise as to whether the observed drop in employment is really a consequence of the declining availability of European labor through time. The latter half of the 1970s witnessed a substantial rate of emigration by Europeans. Almost no data are available to undertake a detailed examination of the consequences of this exodus for the operation of the labor market. However, at least a simple test may determine whether the decline in demand for labor in various industries was really a result of the mounting emigration of Europeans rather than of a sudden drop at the time of the new Employment Act. In particular a measure of aggregate, net European emigration may be added to the regression equations. But no significant change in the estimated coefficients on the job security dummy is found with this addition.

We are unable to test directly whether some other, concurrent change in the labor market at the time of Zimbabwe's Independence actually induced the observed drop in labor demand. The major change was the sharp rise in wages, but this is explicitly accounted for in the regressions. It might be tempting to suggest that the shift to a socialist regime prompted a sudden loss in confidence on behalf of employers and hence a reluctance to commit to longer-term activities. But in fact an investment boom occurred in manufacturing immediately following Independence, so loss of confidence seems an implausible explanation. Rather it seems that the investment boom may well have remained very capital intensive precisely because of the new job security regulations and hence the reluctance to employ commensurate additional labor.

Effects of the Job Security Regulations in Various Industries

Here we consider the size of the estimated magnitudes of the associated drop in labor demand and what might explain some of the differences across industries in the two countries. Tables 1 and 2 display the estimated long-run effects of job security regulations in India and Zimbabwe, respectively. The estimated reduction in employment after any delays in adjustments have been worked through is given by industry. In many industries the estimated effects are very substantial. In India employment is estimated to have been reduced more than 5 percent in 25 of the 35 industries and more than 15 percent in 7 of them. But the estimated long-run employment effects of the new regulations vary considerably across the 64 sectors. We therefore enquire whether something systematic distinguishes those industries in which the consequences of the new regulations are greatest.

Interindustry variations in India. At least three factors might be at work in India. First, during our period of observation the job security provisions of the 1976 amendment were limited to establishments employing more than 300 employees. Consequently, a smaller drop in employment as a result of the legislation should be expected among industries in which smaller factories predominate, even within the census sector. Second, public enterprises commonly hoard

labor, often under political pressure to provide employment and offer patronage. As a result, industries in which public enterprises dominate are less likely to have been affected by the new legislation. Third, more highly unionized sectors probably already provided greater job security even before the new legislation, and in addition it seems likely that stronger unions are better placed to resist any decline in private sector employment resulting from the new legislation.

Table 1. *Estimated Long-Run Reduction in Employment Resulting from Job Security Regulations for 35 Industries in India*

Industry	*Percentage reduction*
Dairy	13.6
Flour and bakery	3.3
Sugar	11.1
Edible oils	6.1
Tea	11.6
Miscellaneous food	0.0
Beverages	3.6
Tobacco products	0.0
Cotton textiles	36.1
Silks and synthetics	44.8
Jute	2.4
Woolen products	6.3
Textile products	0.0
Wooden products	7.4
Paper	5.1
Leather products	0.0
Rubber products	10.0
Oil and coal products	0.0
Basic chemicals	13.2
Fertilizer	11.0
Paints and dyes	6.0
Plastics	18.5
Pharmaceuticals	10.3
Soaps and cosmetics	33.3
Miscellaneous chemicals	7.4
Cement	6.7
Nonmetallic mineral products	10.6
Nonferrous metals	25.4
Metallic products	11.5
Agricultural machinery	0.0
Nonelectrical machinery	42.8
Electrical machinery	10.3
Railway equipment	19.6
Motor vehicles	7.4
Bicycles	3.2
Weighted average	17.5

Source: Authors' calculations.

These three factors are explored in the following regression in which each observation represents one industry:

$$A = 0.113 + 0.175\,\text{PP3} - 0.145\,\text{PUM} \qquad (2)$$
$$(3.48) \quad (2.92) \quad (2.51)$$
$$N = 35, R^2 = 0.13$$

where A is the estimated long-run job security effect, PP3 is the proportion of employees in private sector establishments employing more than 300 employees, and PUM is the proportion of employees who are union members. This equation is estimated by ordinary least squares, adopting the heteroskedasticity robust computation of the variance-covariance matrix suggested by White (1980).

The positive coefficient estimated on PP3 is consistent with the first two antici-

Table 2. *Estimated Long-Run Reduction in Employment Resulting from Job Security Regulations for 29 Industries in Zimbabwe*

Industry	*Percentage reduction*
Meat	27.7
Food canning	20.7
Grain mills	14.5
Bakery products	0.0
Confectionery	10.6
Miscellaneous food	6.3
Alcoholic beverages	8.5
Soft drinks	4.7
Tobacco products	31.1
Cotton textiles	64.0
Knitted products	3.3
Other textile products	0.0
Apparel and footwear	18.9
Wood products	0.0
Furniture	12.9
Paper products	99.7
Printing	18.7
Fertilizer	97.6
Paints	20.3
Soaps and pharmaceuticals	91.0
Miscellaneous chemicals	3.1
Basic chemicals	27.6
Rubber products	54.9
Plastic products	40.2
Structural clay products	0.0
Nonmetallic mineral products	35.9
Metal products and machinery	15.1
Electrical machinery	36.5
Other vehicles	0.0
Weighted average	25.2

Source: Authors' calculations.

pated patterns. Thus the estimated decline in employment as a result of the 1976 amendment is greater in industries in which the fraction of employees in private sector enterprises employing more than 300 workers is greater. The negative coefficient on PUM supports the third argument that the drop in employment within a sector was less the greater the strength of unions.

Interindustry variations in Zimbabwe. A similar approach may be adopted for the results for Zimbabwe and generates the following regression across industries:

$$A = \underset{(1.61)}{4.544} - \underset{(1.60)}{5.215}\,\text{AFR} + \underset{(1.74)}{2.408}\,\text{SZE} + \underset{(1.47)}{1.319}\,\text{QGR} \tag{3}$$

$$N = 29, R^2 = 0.14$$

where AFR is the proportion of employees who are African, SZE is the number of employees per establishment, and QGR is the average annual proportional growth in output after 1980.

The negative coefficient on AFR suggests that the new regulations have been most effective in raising the cost of adjustment in those industries with the lowest proportion of African workers. This does not seem to have been the original intent of the Employment Act. But it does mean that the job security regulations have at least weighed against displacing previously disadvantaged African employees. However, we cannot discern the extent to which this result reflects a residual effect of European emigration, causing sharper employment declines in industries that employed more Europeans.

The positive coefficient on SZE tells us that the industries with larger factories have reduced employment levels most as a result of the new regulations. This may well reflect greater administrative difficulty in imposing such regulations on smaller firms and perhaps greater diligence in enforcing the new regulations on larger firms. The positive coefficient on QGR indicates that industries that have grown most rapidly during the boom after Independence are estimated to have been most affected by the new regulations: the potential for new job creation in the boom thus appears to have been denied by Zimbabwe's regulations.

VI. Conclusions

The cumulative evidence from this study shows that the extreme job security regulations in India and Zimbabwe significantly reduced the demand for workers at given levels of output. No evidence was found to suggest that employers were able to compensate by lowering wages or (at least in India) by increasing hours per employee. The magnitude of the estimated decline in demand for employees varies considerably from industry to industry but does follow a significant pattern. The more interesting pattern is in India, where industries with more public enterprises seem to have been less affected, where stronger unions have resisted reductions and probably already offered greater

security, and where coverage restricted to larger enterprises has limited the impact on industries with smaller plants.

The weighted, average estimated impact on jobs, given output, is quite large in both countries: employment declined 17.5 percent in India and 25.2 percent in Zimbabwe. In both countries this lack of wage jobs should be of serious policy concern, because open unemployment remains high in Zimbabwe and the industrial labor market is hardly tight in India. The boom after Independence in Zimbabwe revealed that entrepreneurs had sufficient confidence to invest in plant and equipment but not in tenured jobs: the rapid growth industries apparently were quite reluctant to hire following the new regulations. In India coverage of the job security provisions was extended in the 1980s, and unusually high industrial growth has been accompanied by employment declines in the covered sector. To what extent this more recent drop may be attributed to the job security regulations must remain a matter for speculation and future analysis, because sufficient recent data are not available for adequate investigation.

Given actual implementation, the regulations thus indeed appear to have offered greater job security to those fortunate enough to obtain jobs. However, the cost has been in less jobs. Almost no evidence is found to suggest that the new regulations actually retarded employment adjustments under changing market conditions, although slow adjustments were a feature of industrial labor markets in both countries even before the new regulations. (This lack of evidence on slower adjustments may, however, result from the availability of only annual data, masking more sluggish changes within a year.) Apparently the potential for structural adjustments may thus not have been significantly retarded—adjustments can be made at considerable cost, thus leading to the lower employment estimated.

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Diversification of Macroeconomic Risk and International Integration of Capital Markets: The Case of Mexico

Luis F. de la Calle

This article tests the arbitrage pricing theory in the context of the unstable macroeconomic years in Mexico, 1977–87. Using information on returns on assets available to domestic investors—primarily stocks traded at the local stock exchange—an attempt is made to ascertain the extent to which these assets have offered premia for a set of proposed sources of risk. The pervasive factors that play an important role in asset pricing in Mexico are unexpected inflation, unexpected money growth, innovations in the Standard & Poor's 500 price series, and innovations in the dollar oil price. A residual market factor is obtained, using the McElroy and Burmeister model. Given that these risks get premia over and above the riskless rate, expected rates of return in Mexico have been higher during the years of erratic macroeconomic conditions. Mexico is not considered to be well integrated with the international capital markets because local sources of risk—such as inflation—are not priced in the United States, whereas international sources of uncertainty—such as oil price shocks—are priced locally but not in the United States.

Capital markets are becoming increasingly important in developing countries. Because of the international debt problem, it seems unlikely that semi-industrial nations will be able to raise substantial amounts of funds in the international financial markets. The development and growth of modern domestic capital markets will allow these economies to tap additional savings and to improve the allocation of scarce funds. Organized and liquid capital markets are a vital factor in promoting overall development: they provide a means of allocating capital to alternative private and public projects, and they furnish essential information for evaluating investment undertakings (Ross 1978; Black 1988).

We use the arbitrage pricing theory (APT) model (Ross 1976) to ascertain how different sources of nondiversifiable risk imply cross-sectional variation of prices

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of assets that Mexican investors are likely to hold. We apply this model tc quite unstable macroeconomic period in Mexico and conclude that the econoı has offered premia for a set of identifiable pervasive risks. Moreover we a unable to reject the cross-equation restrictions implied by APT pricing.

If the market has priced the various risk sources for investors in Mexico, ti prices will unveil the extent to which the assets' returns have carried premia compensation for uncertainty. A highly unstable environment such as Mexic is an excellent proving ground for asset-pricing models because the sources *risk—high rates of inflation and volatile exchange rates—are probably easier identify there than in a more stable economy. In addition this high variabilit improves the efficiency of standard procedures used to estimate and test eco nomic models.*

This article first looks at the increased riskiness in the Mexican economy, then briefly describes the APT model, and discusses the extension of the model to an open economy. Four macroeconomic risk factors are defined: unexpected inflation, unexpected changes in the Standard & Poor's (S&P) 500 price index, innovations in the dollar price of oil, and innovations in the Mexican M4 money supply. Because estimation of an APT system of equations depends crucially on including all pervasive sources of risk, the residuals of the return on a well-diversified portfolio are used to mimic an extra factor.

An empirical estimation of the APT model shows that the proposed sources of risk appear to be priced in the Mexican economy and thus that expected returns offer premia for this unwanted riskiness. Data show that the Mexican economy is not well integrated with international capital markets.

I. Increased Riskiness in the Mexican Economy

From 1955 to 1972 in Mexico the average annual inflation rate was 4.7 percent; real gross domestic product (GDP) grew by an average of 7.0 percent annually, with a standard deviation 2.1 percent; and the exchange rate was stable at Mex$12.5 per dollar. The 1970s opened with higher than normal inflation rates of foreign origin, and in 1973 the Banco de Mexico abandoned its long-standing conservative monetary policy and became a major source of public sector financing. Subsequently, Mexico suffered a series of balance of payments crises, preceded by important appreciations of the real exchange rate. From 1973 to 1987 the economy grew by an average of 4.0 percent annually, with a standard deviation of 4.5 percent; the consumer price index increased by 300 percent; and the domestic currency was acutely overvalued between 1972–76 and 1977–81 and depreciated substantially in real terms afterward.

A large body of literature documents the effects of high inflation rates on the variability of inflation, on relative prices, and, especially, on relative price variability (Cukierman 1983; Fischer 1982; Taylor 1981). These studies contend that increases in the variability of the unexpected component of inflation may cause a real misallocation of resources. Moreover the policies designed to reduce

the rate of increase in prices may produce still more uncertainty. Blejer and Leiderman (1982) present evidence that unexpected inflation and relative price variability are strongly and positively correlated in Mexico. Aspe and Blanco (1984) find negative correlations between uncertainty and production and employment. They conclude that the expansionary government policies of the 1970s and the 1980s increased overall uncertainty and led to a decline in real output.

II. Arbitrage Pricing Theory

Ross' (1976) APT is used to analyze the extent to which the increased riskiness in the Mexican economy was reflected in higher expected returns and to determine whether different exposure to a set of domestic and international sources of risk explains differences in expected returns across assets. The APT decomposes the total premium offered by any one asset into as many parts as there are sources of systematic risk. Thus, for example, we can ascertain whether a specific security offers a positive or negative premium for inflation risk, exchange rate risk, and so forth.

The APT assumes that the set of systematic risk factors determining asset prices is small compared with the number of assets available to investors and that, as a consequence, many linear combinations of assets' returns are close substitutes. Thus the exhaustion of arbitrage opportunities implies specific cross-sectional restrictions on the asset-pricing equations. Neither the capital asset-pricing model nor the APT model are universally accepted as adequate frameworks for pricing assets in actual economies. The empirical applicability of the capital asset-pricing model has been contested over the years because it is necessary—although virtually impossible—to identify the market portfolio to test the model (Roll 1977). Applications of the APT have been challenged on grounds that it is not plausible to interpret the estimates of risk prices (Shanken 1982). However, McElroy and Burmeister (1988) have shown that the use of measured macroeconomic factors is crucial in giving economic meaning to estimated risk prices, and de la Calle (1989) has demonstrated that in a competitive model the prices do have an economic meaning.

The APT model is applied to the study of relative prices of assets held by Mexicans. We estimate the model for 1977–87 to discover systematic sources of risk that are priced in equilibrium and to test the cross-equation restrictions derived from the no-arbitrage-opportunity condition. This research is, to our knowledge, the first comprehensive attempt to use returns on stocks traded at the Bolsa Mexicana de Valores S.A. de C.V. to test asset-pricing models.

The Model

The APT model is an arbitrage model that determines prices of assets and the associated risk premia for each kind of pervasive risk assets face, on the assumption that the expected return of an arbitrage portfolio is zero. The assumption of

no arbitrage profits means that the expected return on a portfolio with no net outlay of capital and subject to no risk should be zero. The implication of this condition is illustrated by assuming that dollar asset returns are generated in each time period by a linear factor model. Dollar—not peso—asset returns are used to overcome the econometric difficulties presented by the Mexican peso problem. The linear factor model used is:

$$(1) \qquad R_{it} = a_{it} + \sum_{j=1}^{K} b_{ijt} \cdot f_{jt} + \epsilon_{it} \qquad \begin{array}{l} i = 1, \ldots n \\ t = 1, \ldots T. \end{array}$$

The rate of return of asset i at time t is denoted by R_{it}. The expected rate of return of asset i at time t, denoted by a_{it}, is conditional on information available at the end of period $t - 1$. The sensitivity, or factor loading, of asset i to risk factor j at time t is denoted by b_{ijt}, and there are K risk factors. The value the innovation of pervasive risk factor j takes at time t is denoted by f_{jt}. And a random unobservable error specific to asset i at time t is denoted by ϵ_{it}.

According to equation 1, the realized return of asset i at time t might differ from its conditional expectation if either the specific risk ϵ_{it} or any one of the risk factors f_{it} takes on a nonzero value. Ross (1976) assumed that equilibrium asset prices followed the linear factor model and showed that the no-arbitrage-profit condition implied that in a sequential economy the expected return of asset i at time t is given approximately by

$$(2) \qquad a_{it} = \lambda_{ot} + \sum_{j=1}^{K} b_{ijt} \cdot \lambda_{jt} \qquad \begin{array}{l} i = 1, \ldots n \\ t = 1, \ldots T. \end{array}$$

In equation 2 λ_{ot} denotes the risk-free rate of interest, and λ_{jt} is the premium (or discount) offered to investors for assuming one unit of risk from factor j. Thus equation 2 indicates that asset i has an expected return exceeding the riskless rate by an amount that depends on the sensitivities (denoted by b_{ijt}) of its return to realizations of the K risks and on the market "prices" (λ_{jt}) of these risk sources.

The risk premium a portfolio offers as compensation for being subjected to a particular source of risk j is given by $b_{ijt} \cdot \lambda_{jt}$ because this is asset i's excess expected return, net of other riskiness, over and above the riskless rate λ_{ot}. The market pays premia, in the form of different expected returns across assets, only for risk factors that are systematic; there is no compensation for diversifiable riskiness. The APT holds at any point in time, and thus the factor loadings (sensitivities to risk factors) and the risk prices do not have to be constant. However, for estimation purposes we will assume they are constant (b_{ij} and λ_j) for the corresponding sample.

Combining equations 1 and 2 yields a set of n APT equations that will be empirically estimated:

$$(3) \qquad R_{it} = \lambda_o + \sum_{j=1}^{K} b_{ij} \cdot \lambda_j + \sum_{j=1}^{K} b_{ij} \cdot f_{jt} + \epsilon_{it} \qquad \begin{array}{l} i = 1, \ldots n \\ t = 1, \ldots T. \end{array}$$

This set of APT equations represents the evolution of returns to individual assets and portfolios. The return to an equally weighted portfolio, denoted RDP_t, is given by

$$\text{(4)} \qquad RDP_t = \lambda_o + \sum_{j=1}^{K} b_{pj} \cdot (\lambda_j + f_{jt}) + \epsilon_{pt} \qquad t = 1, \ldots T,$$

where

$$b_{pj} = \sum_{i=1}^{n} (1/n) \cdot b_{ij}, \qquad \text{and} \qquad \epsilon_{pt} = \sum_{i=1}^{n} (1/n) \cdot \epsilon_{it}.$$

We will assume that RDP_t is the return of a well-diversified portfolio, that is, of a portfolio free of nonsystematic risk. (See McElroy and Burmeister 1988 and de la Calle 1989 for a discussion of this assumption.)

Macroeconomic Risk Factors in an Open Economy

The theory of arbitrage pricing has not been used to identify which unexpected events are likely to be pervasive and thus affect the expected returns to assets. Early empirical work used maximum likelihood factor analysis to identify a number of factors that explained an arbitrarily fixed percentage of the variance of returns (Roll and Ross 1980; Dhrymes, Friend, and Gultekin 1984). Although this approach can produce good estimates of expected returns, it has been criticized because neither the factors nor the associated risk prices that result from such an exercise have a clear economic interpretation. More recent studies (Burmeister and Wall 1986; Chen, Roll, and Ross 1986; McElroy and Burmeister 1988; Burmeister and McElroy 1988), however, have proposed the use of measurable macroeconomic factors as likely sources of risk. Their central claim is that risk premia estimated with the APT using factors we can clearly identify are susceptible to economic interpretation.

International finance economists use the term "perfect capital mobility" to describe the situation of perfect substitutability of assets in different countries and instantaneous adjustment of portfolios (Dornbusch 1980). Perfect capital mobility implies that yields are continuously equalized and that asset holders are continuously in portfolio equilibrium. The concept of perfect capital mobility is used to explain the equilibrium trajectory of the real exchange rate and to determine the ability of the central bank to conduct monetary policy.

To accommodate real-world developments that cannot be accounted for by the assumption of perfect capital mobility, it is often supposed either that assets are not perfect substitutes or that frictions exist that hinder the free flow of capital. For instance it is assumed that only nationals of one country can hold domestic assets or that the sole way to increase foreign holdings is through current account surpluses.

The admission of uncertainty of returns—many international models assume perfect foresight—represents a departure from perfect capital mobility. There is

no reason to believe that assets in different countries react equally to any one shock or, more important, that they are subjected to the same set of shocks. Conventional wisdom then is that under uncertainty we should expect differences in expected rates of return across a sample of countries with dissimilar assets.

In an APT world the concepts of capital mobility and domestic and international securities have a special meaning, nonetheless. It is not only the intrinsic nature of assets that determines their pricing and expected returns, but also the composition of the market portfolio (de la Calle 1989). We take as an example a small country whose wealth as a proportion of the world's is negligible and which has no exchange controls, so that its citizens can hold internationally well-diversified portfolios. If the world market is able to diversify away all of the small country's risk, then returns to assets in the small country will offer expected returns with premia only for internationally pervasive sources of risk. The small country's domestic riskiness will not be compensated for in equilibrium. Thus the expected returns of purely domestic assets, such as real estate, will not carry premia for domestic risks regardless of the fact that these assets are not traded internationally. In short, for small countries perfect capital mobility means that all domestic sources of risk are idiosyncratic at the world level and that therefore they play no role in the equilibrium pricing of assets.

There are two conditions under which a premium will be paid for any domestic source of risk. First, if the country is small but movement of capital is restricted, expected returns to domestic assets will carry an extra premium and the expected domestic market return will be unnecessarily high. Second, there will be a premium if the country is not small enough to have its specific sources of risk eliminated through international diversification.

Macroeconomic Variables Likely to Influence Returns on the Assets of Mexican Investors

The APT provides no information about which macroeconomic factors are likely to influence returns. However, if asset prices are discounted expected cash flows, then all systematic variables affecting cash flows or the discount rate help to determine asset returns. Also variables that convey information about the future state of the economy are likely to affect returns.

There are six Mexican and international macroeconomic variables whose innovations might explain a substantial percentage of the variability of returns on assets held by Mexican investors.

- Unexpected changes in the domestic inflation rate not only affect the cash flow of many securities and the discount rate but also might change relative prices. In addition, inflationary innovations are probably good predictors of future devaluations, especially when exchange rates are fixed.
- Unexpected growth in the domestic money supply is a valuable source of

information concerning the state of public finances and the response of government policy to exogenous shocks.

- Unexpected devaluations of the Mexican peso have a clear impact on asset returns. The exchange rate influences both the general price level and relative prices.
- Innovations in the domestic rate of productive activity should affect stock returns through cash flows.
- Unexpected changes in the international price of oil have enormous consequences on the Mexican economy: they affect the terms of trade and thus real disposable income, and they have a definite impact on the budget deficit.
- Innovations in the S&P 500 price index summarize many of the international risks that are likely to disturb Mexican stocks.

This list does not include a variable that would capture directly the dynamics of the debt problem. If the APT holds, under certain conditions we could use the return of debt in the secondary market—which would follow the linear factor model—to mimic a pervasive factor. Unfortunately, it is extremely difficult to construct a long series (1974–87) of innovations of debt returns of equal maturity in the secondary market. Moreover the evolution of the debt problem is captured in our residual market factor.

III. Estimation of the Macroeconomic Risk Factors

Ways to measure the macroeconomic risk factors described above are specified to obtain time series of unanticipated movements. The unanticipated innovations are specified by the forecast errors of a Bayesian vector autoregressive model. The model is used to develop four primary factors, and a proxy for a fifth missing factor is composed of the residuals of a regression of the return on a well-diversified portfolio on the four primary factors (McElroy and Burmeister 1988).

The macroeconomic risk factors are estimated as forecast errors from Bayesian vector autoregressions, as in Litterman (1986). The Bayesian procedure can represent more accurately the uncertainty about the structure of the economy and therefore generate probability distributions of future economic events that are significantly better than those produced by conventional techniques.

The Four Primary Factors

Seven variables comprise the first approximation of the vector to be estimated: the price index constructed from the equally weighted average of the peso-denominated returns on 54 assets (see appendix A), the Mexican consumer price index, the dollar S&P 500 price index, the international dollar price of oil, the rate of increase in the peso-dollar exchange rate, an index of industrial

production in Mexico, and the Mexican M4 money supply. The aggregate M includes bills and coins, demand deposits, time deposits of several maturities i commercial banks, dollar-denominated demand deposits, and dolla denominated time deposits of several maturities in Mexican commercial bank Other monetary aggregates—M1 and the domestic credit component of th monetary base—were tried unsuccessfully. The seven variables were defined a logarithms of levels, because in this form they are more likely to approximat the random walk specification of the Bayesian system.

The Bayesian system was estimated for the seven variables from 1974:1 t 1987:12, using 12 lags for each variable. Since agents in the economy forr expectations conditional on the information they have at the time, it would nc be entirely correct to use the whole sample to estimate the system's coefficient and then to utilize the residuals as forecast errors. In order to form conditiona forecasts, a Kalman filter technique was used to update monthly the informatio used in the estimation. The system's initial parameters were estimated from dat from 1974:1 to 1977:2 and were then updated by the Kalman filter.

For several different sets of assumptions, four factors usually had significan explanatory power on the return to an equally weighted portfolio, RDP_t: unexpected inflation (*cpi*), unexpected changes in the S&P 500 (*sap*), oil price shock (*op*), and money shocks (*M4*). Unexpected devaluations were marginally significant, and unexpected changes in industrial production were statisticall insignificant.

The four macroeconomic measures were used in the APT estimation to estimate the value of the four risk factors, f_{1t}, f_{2t}, f_{3t}, and f_{4t}:

$$
\begin{aligned}
f_{1t} &= cpi_t - \hat{E}[cpi_t/t-1], \\
f_{2t} &= sap_t - \hat{E}[sap_t/t-1], \\
f_{3t} &= op_t - \hat{E}[op_t/t-1], \\
f_{4t} &= M4_t - \hat{E}[M4_t/t-1].
\end{aligned} \tag{5}
$$

The $\hat{E}[\cdot/t-1]$ terms are the estimates of the unobserved expectations held by agents at the end of period $t-1$.

The statistical characteristics of the macroeconomic variables show they are far from perfectly correlated, and no one variable can be substituted for another. Each of them is expected to make an independent contribution in explaining the variability of returns. Rationality was tested by a Lagrange Multiplier Test for serial autocorrelations of the residuals (Engle 1984). For all four factors we are unable to reject the null hypothesis that these residuals are not autocorrelated at any commonly used level of confidence.

The Proxy for a Missing Factor

The derivation of the pricing equation 2 rests on the presumption that there is an unlimited number of assets. Thus, by applying the law of large numbers, the economy is able to diversify entirely all nonsystematic risk. However, Dybvig (1983) and Grinblatt and Titman (1983) have shown that an explicit upper

bound can be placed on the deviations of the individual assets' expected returns from APT pricing in finite economies. Their result hinges crucially upon the assumption that the random error ϵ_{it} in the linear factor model (equation 1) is indeed a disturbance specific to asset i and is free of systematic risk, and thus the impact of idiosyncratic risk in a diversified portfolio is very small.

In this light it is very important that the set of macroeconomic pervasive factors be made as complete as possible in the econometric testing of APT. The absence of factors can produce gross mispricing of some assets and cause the APT restrictions to be rejected even if they are true.

Following the work of McElroy and Burmeister (1988), the return on a well-diversified portfolio is employed to mimic the time series of a potentially missing factor. Assuming that one of the K factors is unknown, equation 4 can be rewritten as:

$$(6) \qquad RDP_t = \lambda_o + \sum_{j=1}^{K-1} b_{pj} \cdot (\lambda_j + f_{jt}) + \lambda_K + f_{Kt} + \epsilon_{pt} \qquad t = 1, \ldots T,$$

where b_{pK} is normalized to equal 1. Given that the missing factor, f_{Kt}, is unknown, equation 6 is written more simply:

$$(7) \qquad RDP_t = a_p + \sum_{j=1}^{k-1} b_{pj} \cdot f_{jt} + u_{pt} \qquad t = 1, \ldots T,$$

where $u_{pt} = f_{Kt} + \epsilon_{pt}$. The residuals of equation 7 contain valuable information about the missing factor f_{Kt}. If we assume that the portfolio at hand is well diversified and thus has negligible idiosyncratic risk, then ordinary least squares residuals $\hat{u}_{pt}$ are a consistent estimator of f_{Kt} (under the assumption that f_{Kt} is orthogonal to the other factors). Intuitively, as the portfolio grows in size, the weight of any one asset is reduced and the impact of idiosyncratic shocks on returns greatly diminished.

We attempted to develop a fifth missing factor by assuming that the portfolio was well diversified and by regressing its return, RDP_t, (measured in dollars) on the four macroeconomic factors obtained from the Bayesian system. The results are shown in table 1. Except for the money shocks risk factor, each factor has

Table 1. *Regression of the Return to a Well-Diversified Portfolio on Four Primary Macroeconomic Risk Factors*

	Constant	*Inflation shocks*	*Change in the S&P 500*	*Oil price shocks*	*Money shocks*
Coefficient	3.160	−360.73	133.84	27.412	28.90
	(2.20)	(−3.66)	(3.33)	(1.58)	(0.39)
$R^2 = 0.23$					
D.W. = 1.92					
Sample period 1979:1 to 1987:12					

Note: t-statistics are in parentheses below the estimated coefficients. Ordinary least squares regression was applied to obtain these results.

Source: Author's estimates; see appendix A.

significant explanatory power on the return of the portfolio. Together they account for almost one-fourth of the variation of the portfolio as indicated by the value of R^2. We cannot accept the null hypothesis that the four factor loadings are zero at commonly used levels of confidence. Given that we intend to utilize the residuals of equation 7 as a proxy for the fifth factor, the regression results were carefully scrutinized for heteroscedasticity and autocorrelation of residuals (de la Calle 1989).

To estimate the system of APT equations 3, we defined as a fifth macroeconomic factor the ordinary least squares residuals of a regression of the return of the portfolio on the four primary factors, as shown in table 1. The inclusion of this fifth factor in the estimation ensures that the list of pervasive factors is as comprehensive as possible. This factor is especially important because it was developed using stock market information. Because of the relatively smooth nature of most macroeconomic series, we cannot expect them to capture all the information available to the market in some period. Stock prices, however, respond very quickly to public information. Thus we can guess that a residual factor derived from stock market data would help to explain expected returns across assets. The fifth factor was defined as

$$f_{5t} \equiv RDP_t - \hat{RDP}_t. \tag{8}$$

Since the fifth factor proxies an unobserved source of risk, it is difficult to attach to it any particular meaning. It might be a measure, for instance, of surprises in "market psychology," or it might capture "rumors of imminent controls on capital mobility."

The Mexican Peso Problem

We first attempted to develop the residual market factor by running the peso return of the portfolio on the four primary factors. The results obtained were very similar to those in table 1, but with two main differences. First, inflation innovations were insignificant, and monetary surprises were significant. Second, the residuals showed acute first-order autocorrelation, which is attributed to the endemic presence of the Mexican peso problem in Mexican asset returns. The term "Mexican peso problem" describes the observed phenomenon of a considerable time period during which an expected event (a large devaluation) does not materialize. This generates measured surprises that have nonzero means and are autocorrelated (Lizondo 1983). Autocorrelated residuals were found only in large portfolios. In regressing the peso returns of individual assets on the four primary factors, no autocorrelation was detected. However, when the number of assets in the portfolio was increased, the autocorrelation increased correspondingly. This occurs because the aggregation of individual returns eliminates the idiosyncratic risk (not autocorrelated), while it leaves the nondiversifiable autocorrelated factor. We interpreted this phenomenon as indicating a missing pervasive factor, itself autocorrelated, that was discovered only as individual assets were aggregated in increasing portfolios. The prime candidate for an autocorre-

lated pervasive innovation was the time series of unexpected devaluations of the peso. Running the APT model with returns measured in dollars bypasses the econometric problems encountered with autocorrelated residuals (neither residuals of individual asset dollar returns nor those of portfolio dollar returns are serially autocorrelated) and adds information in that the model encompasses the effect of exchange rate movements and of the missing factor (de la Calle 1989).

IV. Estimation and Interpretation of the APT Risk Premia

Armed with the five risk factors developed above, we can now estimate the nonlinear system of equations 3 by using an iterated nonlinear, seemingly unrelated regressions technique (the data are described in appendix A and the details of the technique in appendix B). Estimates were computed for two distinct subsamples of 24 assets each for 1980:1 to 1986:12 (a compromise between sample size and computer capabilities). One-month holding period returns of U.S. Treasury bills were used as a proxy for the risk-free rate of interest (λ_{0t}) as done by McElroy and Burmeister (1988). Tables 2 and 3 display the estimates of the factor loadings for the two samples.

Most of the factor loadings (or sensitivities) with respect to the inflation risk factor (f_{1t}) are very significant and, generally, negative. The residual risk factor (f_{5t}) is also overwhelmingly significant. The two "foreign" factors—innovations on the S&P 500 price index (f_{2t}) and on the dollar price of oil (f_{3t})—are significant in more than half of the cases. Factor loadings with respect to the S&P-500-price-index risk factor are positive in all cases. They are negative in some cases with respect to the dollar-price-of-oil risk factor. In these two samples the monetary-surprises risk factor (f_{4t}) appears not to exert a remarkable influence on returns.

Table 4 reports the risk factor prices for samples 1 and 2. The price of the inflation risk factor turns out to be marginally significant and positive in both samples. This, coupled with negative factor loadings, implies that the securities in the sample are generally good countercyclical hedges with respect to unexpected inflation and thus have a low expected return, other things being equal. Risk factor prices for changes in the S&P 500 index and the residual risk factor are significant in both cases; the former is negative, and the latter is positive. The price of the oil-price-shocks risk factor is also significant and switches signs between samples. The price of the money-shocks risk factor, as anticipated, appears to play no major role.

Table 4 presents the Lagrange multiplier test results for the APT restrictions as well. We are unable to reject at commonly used significance levels the null hypothesis that the restrictions in equation 2 hold. It looks as if, under the maintained hypothesis that the linear factor model holds, the APT restrictions are not too stringent to impose on the data, and thus that expected returns are linearly related to their sensitivities with respect to macroeconomic surprises.

Table 2. *Estimated Asset Sensitivities to the Five Risk Factors, Sample 1*

Asset	*Inflation shocks*	*S&P 500 price index*	*Dollar price of oil*	*Money shocks*	*Residual factor*
14	−643.39	108.48	49.061	136.33	1.598
	(−4.35)	(1.83)	(2.07)	(1.34)	(10.94)
54	−161.89	51.316	9.162	−133.78	0.362
	(−2.29)	(1.77)	(0.79)	(−2.74)	(5.15)
28	−540.48	86.239	51.349	78.289	0.914
	(−5.58)	(2.22)	(3.30)	(1.18)	(9.55)
11	147.17	76.394	−69.740	−316.81	1.921
	(0.40)	(0.52)	(−1.19)	(−1.27)	(5.34)
42	−482.73	101.36	30.989	22.229	0.995
	(−11.02)	(5.74)	(4.39)	(0.74)	(22.96)
52	−285.23	45.754	5.236	−117.18	0.532
	(−4.88)	(1.91)	(0.55)	(−2.91)	(9.18)
16	−250.47	110.25	58.716	301.33	1.661
	(−0.60)	(0.66)	(0.88)	(1.05)	(4.04)
47	104.63	73.388	13.460	18.754	0.066
	(1.89)	(3.21)	(1.48)	(0.49)	(1.20)
33	−521.25	75.977	17.953	25.926	0.833
	(−12.10)	(4.24)	(2.52)	(0.87)	(19.48)
29	−807.37	154.25	52.652	82.380	1.260
	(−7.58)	(3.58)	(3.06)	(1.12)	(11.95)
23	−804.38	76.017	39.917	−43.749	1.167
	(−6.67)	(1.56)	(2.06)	(−0.53)	(9.79)
15	−177.63	80.304	48.486	1.774	0.949
	(−1.30)	(1.46)	(2.20)	(0.02)	(7.02)
09	−593.43	110.87	24.317	−10.232	0.849
	(−3.59)	(1.69)	(0.92)	(−0.09)	(5.20)
30	−684.75	76.157	32.329	40.191	0.946
	(−6.98)	(1.93)	(2.05)	(0.60)	(9.75)
34	−571.26	125.73	52.103	94.244	1.457
	(−4.28)	(2.36)	(2.44)	(1.03)	(11.05)
17	−224.29	177.11	60.074	18.523	1.150
	(−2.18)	(4.20)	(3.58)	(0.26)	(11.27)
10	−319.31	27.494	−19.327	−127.12	0.909
	(−2.83)	(0.60)	(−1.06)	(−1.64)	(8.15)
35	−396.70	50.227	1.814	−23.389	1.118
	(−2.84)	(0.90)	(0.08)	(−0.24)	(8.10)
40	−219.38	66.165	−14.529	−63.779	0.660
	(−2.06)	(1.55)	(−0.85)	(−0.87)	(6.28)
05	−449.65	187.08	−0.877	83.525	1.686
	(−2.28)	(2.35)	(−0.03)	(0.62)	(8.65)
06	−658.99	98.968	30.847	−48.180	1.531
	(−5.40)	(2.03)	(1.58)	(−0.57)	(12.70)
19	−620.62	78.499	57.276	−82.149	1.120
	(−4.78)	(1.49)	(2.72)	(−0.92)	(9.34)
41	−619.87	109.06	22.734	−28.868	1.159
	(−5.62)	(2.48)	(1.29)	(−0.38)	(10.64)
02	−316.94	105.36	51.124	84.535	0.894
	(−2.36)	(1.97)	(2.39)	(0.92)	(6.74)

Note: t-statistics in parentheses. The 24 assets are in random order and are distinct from those in table 3. The assets are numbered but not named to preserve confidentiality.

Source: Author's estimates; see appendix A.

Tables 2 and 3 in combination with table 4 can be used to explain why particular assets have high or low expected returns. Four assets have high expected returns essentially because they are highly procyclical; their factor loadings with respect to the residual factor are high and very significant as well. Three other assets produce high expected returns by combining large factor loadings with respect to the residual risk factor with big and significant factor loadings with respect to oil shocks. One asset presents a very high total premium because it mixes a large and positive residual risk factor sensitivity with a relatively low, but negative, inflation risk factor sensitivity.

Several assets present low expected returns. In general these assets are good countercyclical hedges and thus have relatively low factor loadings with respect to the residual factor. Other assets display low expected returns regardless of their having large and significant residual risk factor sensitivities, thanks to offsetting sensitivities to other pervasive factors.

The results of the iterated nonlinear, seemingly unrelated regressions technique show that the estimation of the risk prices is very sensitive to the set of assets chosen, at least with the sample size we used. To get good estimates of the risk factor prices requires a good deal of variability of the factor loadings across assets. If in the selected sample many of the assets are close substitutes, the estimates of the risk factor prices will be generally poor because of the multicollinearity of the matrix of factor loadings. A sound estimation of an APT system does not require an infinite sample but rather a varied menu of assets.

The different estimates of the risk prices in samples 1 and 2 are a disturbing result because we should expect an equilibrium model to price equally pervasive sources of risk in any subset of securities. Estimates of the risk prices with samples containing assets from samples 1 and 2 and other assets show that estimates of risk factor prices for inflation, change in the S&P 500, and the residual risk factor are robust to the partition, whereas risk factor prices for oil price shocks and money shocks change across samples. For this reason estimates of the risk factor loadings and risk premia were also obtained through the two-step procedure of Fama and MacBeth (1973). This allowed us to increase the sample size and to estimate the model for 25 rolling samples starting every quarter of the year. The results make patent the fact that the risk factor prices are statistically different from zero in most sample periods, but not in all of them. They also confirm our suspicion of variable risk premia.

V. Imperfect Capital Mobility

The existence of domestic risk factors priced in Mexico is important from the policy point of view. Macroeconomists contend that in an open economy monetary policy is effective as a tool to the extent that the central bank is able to affect the expected return of domestic bonds. Several studies (Cumby and Obstfeld 1983; Kamas 1986) have concluded that at least in the short run the monetary authorities in Mexico have followed a relatively independent policy. The behav-

Table 3. *Estimated Asset Sensitivities to the Five Risk Factors, Sample 2*

Asset	*Inflation shocks*	*S&P 500 price index*	*Dollar price of oil*	*Money shocks*	*Residual factor*
13	−583.33	275.89	−9.310	−42.719	1.584
	(−2.64)	(2.80)	(−0.32)	(0.31)	(7.37)
12	−269.25	84.917	−1.046	−11.044	0.617
	(−2.11)	(1.50)	(−0.06)	(−0.14)	(4.98)
30	−676.62	62.849	30.879	48.064	0.964
	(−6.93)	(1.45)	(2.32)	(0.78)	(10.15)
51	−351.61	36.830	0.086	−102.64	0.507
	(−6.68)	(1.56)	(0.01)	(−3.00)	(9.81)
24	−522.16	110.03	30.816	40.200	1.187
	(−3.88)	(1.84)	(1.74)	(0.48)	(9.09)
37	−738.81	45.542	64.256	67.437	1.564
	(−5.41)	(0.75)	(3.41)	(0.78)	(11.75)
31	−569.99	143.96	15.864	−63.805	1.172
	(−5.34)	(3.03)	(1.11)	(−0.95)	(11.30)
06	−663.61	112.54	22.845	−35.446	1.523
	(−5.44)	(2.07)	(1.39)	(−0.46)	(12.84)
18	−656.27	117.67	25.792	27.381	1.119
	(−9.64)	(3.88)	(2.75)	(0.63)	(16.87)
32	−509.07	113.74	17.685	11.379	1.125
	(−4.40)	(2.21)	(1.16)	(0.16)	(10.02)
04	−397.79	176.47	−54.694	−78.028	0.827
	(−2.92)	(2.89)	(−2.76)	(−0.89)	(6.19)
36	−760.72	50.398	23.890	−24.228	1.286
	(−7.17)	(1.07)	(1.67)	(−0.36)	(12.46)
22	−421.14	108.88	36.411	374.40	0.364
	(−1.49)	(0.86)	(0.91)	(2.07)	(1.32)
26	−395.18	202.20	42.213	29.607	1.486
	(−3.82)	(4.38)	(2.86)	(0.45)	(14.72)
39	−953.73	−30.08	33.798	13.134	1.103
	(−5.80)	(−0.41)	(1.51)	(0.13)	(6.89)
46	112.75	84.768	20.614	25.635	0.062
	(1.19)	(2.00)	(1.50)	(0.42)	(0.67)
01	−228.49	38.552	58.830	94.357	0.858
	(−2.03)	(0.77)	(3.73)	(1.31)	(7.80)
21	−742.06	75.370	40.105	68.950	1.421
	(−5.95)	(1.36)	(2.36)	(0.88)	(11.71)
33	−517.90	64.288	26.462	11.418	0.838
	(−12.20)	(3.39)	(4.38)	(0.42)	(20.21)
08	−812.48	54.612	40.701	162.35	1.649
	(−3.67)	(0.55)	(1.31)	(1.15)	(7.63)
20	−479.72	190.34	14.848	−30.752	1.332
	(−2.65)	(2.36)	(0.62)	(−0.27)	(7.57)
43	−335.98	29.032	4.149	−79.940	0.523
	(−7.01)	(1.35)	(0.60)	(−2.59)	(11.15)
27	−299.15	165.18	11.622	−19.173	1.135
	(−2.08)	(2.58)	(0.60)	(−0.21)	(8.12)
10	−335.30	46.340	−5.700	−163.61	0.870
	(−2.97)	(0.92)	(−0.35)	(−2.26)	(7.88)

Note: t-statistics in parentheses. The 24 assets are in random order and are distinct from those in table 2. The assets are numbered but not named to preserve confidentiality.

Source: Author's estimates; see appendix A.

Table 4. *Estimated Risk Factor Prices and Other Sample Statistics for Samples 1 and 2*

Item	*Sample 1*	*Sample 2*
Risk factor	*Estimated price*	
Inflation shock (λ_1)	0.0042	0.0065
	(1.70)	(1.29)
Change in S&P 500 (λ_2)	− 0.0316	− 0.0282
	(−3.17)	(−1.64)
Oil price shock (λ_3)	0.0655	− 0.1083
	(2.66)	(−2.09)
Money shock (λ_4)	− 0.0008	0.0214
	(−0.15)	(1.57)
Residual risk factor (λ_5)	4.0995	8.8789
	(2.80)	(2.01)
Sample statistics	*Value*	
Average total premium (percent)		
Monthly average	1.3071	1.3138
Per year	16.86	16.96
RDP total premium (percent)		
Monthly average	0.8911	0.4553
Per year	11.23	5.6
Lagrange multiplier test statistic for APT restrictions	18.47	24.00
$\chi^2_{10\%}$ (19)	27.20	27.20

Note: t-statistics in parentheses.
Source: Author's estimates; see appendix A.

ior of the real exchange rate in Mexico in the 1970s and 1980s reflects both the short-run autonomy and the balance of payments "crises" that obtain when an unsustainable policy is pursued (Calvo 1987). A major weakness of these empirical endeavors is that they are unable to distinguish clearly between ex post and ex ante rates of return. The APT model allows us to see whether there is a Mexican component in the expected rates of return.

Our earlier discussion seems to indicate that Mexican expected returns include premia for three domestic sources of risk: unexpected inflation, money innovations, and the residual risk factor. However, we cannot conclude from this that Mexican stocks face a set of pervasive factors different from the set that affects returns in other countries, because innovations in these three factors might reflect international shocks or because all this riskiness might be purely an expression of exchange rate risk. Thus, if inflation innovations only update the expected rate of devaluation, the pricing of the inflation risk factor will be mistakenly interpreted as evidence of imperfect capital mobility. Realizations of the inflation risk factor might also reflect shocks in the world rate of inflation. Similar arguments apply for the monetary-shocks and residual risk factors.

In order to present conclusive evidence about Mexican stocks paying for noninternational riskiness, appendix C assesses whether Mexican returns are sensitive to risk factors with no international components and uncorrelated with

changes in the expected rate of devaluation. The result is that the inflation and residual risk factors exert a statistically nonnegligible influence on the returns of stocks held by Mexicans.

In most of our results risk factor prices for inflation, the dollar price of oil, monetary shocks, and the residual risk factor (λ_1, λ_3, λ_4, and λ_5) have explanatory power over the expected returns in our sample. To discover whether these factors are also priced in other countries, the returns of several Wall Street broad indexes were regressed on the original inflation, dollar price of oil, monetary shocks, and residual risk factors (f_{1t}, f_{3t}, f_{4t}, and f_{5t}). Table 5 demonstrates that these four factors have insignificant explanatory power over the proposed portfolios.

The coefficient of the inflation risk factor is significant in explaining the return of the S&P 500 and New York Stock Exchange financial indexes. This is probably due to the relation between changes in inflation rates in the United States and Mexico.

It is remarkable that the dollar-price-of-oil risk factor plays so minuscule a role in the U.S. financial markets. The fact that this international factor is priced in Mexico and not in the United States reinforces our previous intuition that the composition of the market portfolio determines the size of the premium. The American economy appears to be well hedged against sudden changes in oil prices, but the Mexican economy does not. (For more on the effects of the dollar-price-of-oil risk factor in different countries, see Chen, Roll, and Ross 1986 and Brown and Otsuki 1989.) The Mexican economy is not well diversified with respect to unwanted variability in its terms of trade. This is a power-

Table 5. *Summary Statistics on the Explanatory Power of the Risk Factors over Wall Street Broad Indexes*

Wall Street index	$\bar{R}^2$	$F(4,88)$
New York Stock Exchange index		
Industrial	−0.004	0.91
Transportation	0.000	1.01
Utility	−0.028	0.36
Finance	0.028	1.66
S&P corporation index		
Industrial	0.002	1.05
Capital goods	−0.009	0.79
Consumer goods	0.006	1.13
Transportation	−0.004	0.91
Public utilities	−0.033	0.26
Finance	0.035	1.84
500 Composite	0.002	1.04
Dow Jones industrial average index	−0.019	0.56

Note: The returns of the Wall Street indexes were regressed on the original inflation, dollar-price-of-oil, monetary-shocks, and residual risk factors (f_{1t}, f_{3t}, f_{4t}, and f_{5t}).

Source: Author's estimates; see appendix A.

ful argument for free capital mobility; it means that small economies that are specialized in production, but hold portfolios that are well diversified, can minimize the effects of variable terms of trade on investment decisions.

VI. Summary and Conclusions

This article has applied the APT to the study of relative prices of securities held by Mexicans. A sample of domestic and international assets that are typical of portfolio holdings for Mexican investors was used to estimate the model for 1977 to 1987. We tried to determine whether different exposures to a list of systematic state variables can explain dispersion of expected returns across assets held by Mexicans. Moreover we analyzed whether the increased riskiness accompanying the macroeconomic instability of the 1970s and 1980s was reflected in higher expected returns. We estimated the APT system of equations for 1977 to 1987 to discover systematic sources of risk that are priced in equilibrium and to test the cross-equation restrictions derived from the no-arbitrage-opportunity condition.

In most cases four factors had significant explanatory power on the returns of diversified portfolios: unexpected domestic inflation, unexpected changes in the S&P 500 price index, dollar oil price shocks, and monetary innovations. In addition the residuals of a regression of the return on a well-diversified portfolio on the four factors were used to mimic an extra factor. The five risk factors were used to obtain estimates of the factor loadings and risk prices by using an iterated nonlinear, seemingly unrelated regressions technique. The macroeconomic factors turned out to be important in explaining observed returns of individual securities. The iterated nonlinear, seemingly unrelated regressions technique allowed us to perform a nested test of APT pricing versus the alternative linear factor model. We were unable to reject the hypothesis that APT pricing restrictions are consistent with the data.

The main finding of this article is that the Mexican economy has paid excess premia because of unstable macroeconomic conditions. The returns are sensitive to the macroeconomic factors, and the market prices such sources of risk. This translates into higher expected returns and probably into a lower investment level and is one of the hidden costs of an erratic macroeconomic environment. The total premium in dollars for an equally weighted portfolio of all assets in the sample was estimated to be between six and eleven percentage points a year above the riskless rate (see table 4). Thus we should expect that government policies that foster stability would lower the rates required by investors. Such policies include stable monetary and fiscal policies, the development of a financial market able to create a varied menu of financial instruments, a liberal foreign exchange policy that would allow international diversification, a nondistorting tax system, and so forth.

Finally, it was shown that the Mexican economy is not well integrated with international capital markets because U.S. stock returns are insensitive to inno-

vations in the factors priced in Mexico. We found that domestic sources of risk, such as Mexican inflation, are not priced in the United States. Oil price shocks, an international source of risk, are priced in Mexico but not in the United States. This finding indicates that the Mexican economy is not well diversified with respect to oil price shocks. Furthermore, not only are the signs and sizes of the risk factor premia determined by the intrinsic characteristics of assets' returns, but the composition of the market portfolio also plays an important role.

Appendix A. Data Used to Estimate the APT Model

Ideally the list of returns used to estimate an APT model should be as comprehensive as possible, and it should include a menu of distinct assets in such a way that the risk premia can be estimated. If the collection of assets chosen contains many very close substitutes, it will become virtually impossible to estimate the premia. During the course of a chronic inflation and recurrent devaluations, investors tend to diversify their portfolios to a great extent. It is not uncommon to observe people investing in real estate, durables, the stock market, real estate overseas, foreign currency denominated bonds, and so forth.

We collected monthly data on the returns of 55 assets Mexicans can hold, including 42 stocks actively traded in the Bolsa Mexicana de Valores S.A. de C.V.; a sample of dollar-denominated assets (gold, silver, the S&P 500 price index, U.S. Treasury bills, and Mexican Petrobonos); peso-denominated bonds (certificados de deposito and certificados de tesoreria or CETES); and five durable goods.

Using information published by the Bolsa Mexicana de Valores S.A. de C.V. in several issues of its *Anuario Bursatil y Financiero*, we calculated for 1975:1 to 1987:12 ex post returns of the Mexican common stocks previously mentioned, by correcting the ex-dividend price series by cash dividends, stock dividends, splits, reverse splits, and subscription rights.

The Subdireccion de Estudios Economicos y Bursatiles of the Bolsa Mexicana de Valores S.A. de C.V. generously provided the following time series: Indice general de precios de la BMV, monthly realized returns on CETES, and monthly realized returns on Petrobonos.

The Direccion de Investigacion Economica of the Banco de Mexico assisted us with time series for the price indexes of gold, silver, and all durables.

The following series were obtained from *Indicadores Economicos* of the Banco de Mexico: Ml, monetary base, international reserves, domestic credit, M4, index of industrial production, consumer price index, and peso-dollar exchange rates.

The S&P price indexes series, the New York Stock Exchange price indexes series, and the Dow Jones Industrials price index were drawn from CITIBASE. The U.S. consumer price index and the U.S. Treasury bill rates of return were obtained from *International Financial Statistics* of the International Monetary Fund.

The dollar oil price series were f.o.b. prices of Saudi Arabian light crude petroleum from 1975:1 to 1983:12 and Brent North-Sea spot prices from 1984:1 to 1987:12. Oil price series were obtained from the *Basic Petroleum Data Book* of the American Petroleum Institute.

APPENDIX B. ITERATED NONLINEAR, SEEMINGLY UNRELATED REGRESSIONS TECHNIQUE

Traditionally portfolio pricing models have been tested in two steps (Black, Jensen, and Scholes 1972; Fama and MacBeth 1973; Roll and Ross 1980; Chen, Roll, and Ross 1986). As noted by Gibbons (1982) and McElroy, Burmeister, and Wall (1985), this two-step procedure suffers from an errors-in-variables problem, because the estimated risk factor sensitivities b_{ij} used in the second step are not the true parameters and because this procedure is relatively inefficient because it does not take into account the cross-equation restrictions implied by equation 3. A nonlinear, seemingly unrelated regressions technique avoids the errors-in-variables problem for the factor loadings, and the risk prices are estimated simultaneously. It is relatively more efficient than using ordinary least squares on one asset at a time because it takes into account the cross-equation restrictions. A nested APT versus linear factor model test is well defined, and the cross-equation restrictions can be tested with standard hypothesis testing techniques.

Estimators for an iterated nonlinear, seemingly unrelated regressions technique are consistent and asymptotically normal even without normally distributed errors (Gallant 1987; McElroy, Burmeister, and Wall 1985). This is very important in light of the large set of evidence documenting the departure of returns from normality (Fama 1965; Clark 1973; Blattberg and Gonedes 1974; Epps and Epps 1976; Tauchen and Pitts 1983). In this study we found that the residuals of asset returns in dollars indeed deviate from normality. This makes patent the need to use methods that are robust with respect to non-normal errors, such as the iterated nonlinear, seemingly unrelated regressions technique.

APPENDIX C. NONINTERNATIONAL RISKINESS AND MEXICAN STOCKS

The inflation, monetary-shocks, and residual risk factors are "cleaned" by running regressions on the current rate of U.S. inflation, on the current rate of devaluation, and on 15 leads of the rate of devaluation of the peso. The residuals from these three regressions were used as factors orthogonal to U.S. inflation and present and future devaluations. Table A-1 displays the adjusted $\bar{R}^2$ and F-test statistics for the three regressions.

In all three cases we reject the joint hypothesis that the two sets of coefficients are zero. When we test for the significance of the coefficients of devaluation and its leads, we cannot reject that they are zero for both the inflation and residual risk factors, but we reject that they are zero for the monetary shocks risk factor.

Table A-1. Summary Statistics from Regressions on U.S. Inflation and Present and Future Devaluations

Risk factor	$\bar{R}^2$	$F(17,97)$[a]	$F(16,98)$[b]
Inflation shocks	0.24	3.14	1.84
Money shocks	0.22	2.90	2.94
Residual risk factor	0.23	2.58	0.59

Note: The 5 percent critical point of an $F(16,120)$ is 2.06; of an $F(17,120)$, 2.01.

a. F-test for zero coefficients of current U.S. inflation, current devaluation, and 15 leads of the rate of devaluation.

b. F-test for zero coefficients of current devaluation and 15 leads of the rate of devaluation.

Source: Author's estimates; see appendix A.

This last test is a Sims causality test of inflation, money, and the residual factor on the rate of devaluation (Sims 1972). Thus money innovations are a good predictor for devaluations, but inflation and residual risk factor shocks are not, at the 5 percent level.

The next step was to use the cleaned residuals as pervasive factors and to run regressions of the dollar returns of a host of portfolios on these factors and on the S&P-500-price-index and dollar-price-of-oil risk factors. The returns of 30 portfolios of 1 to 15 holdings were regressed against the redefined factors. In each case the R^2 drops when the redefined factors are substituted for the original ones.

This exercise shows that, despite the fact that the inflation and residual risk factors were made orthogonal with respect to future devaluations and U.S. inflation, they continue to exert a statistically non-negligible influence on the returns of stocks held by Mexicans.

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Debt Relief and Economic Growth in Mexico

Sweder van Wijnbergen

Could external restraint and internal balance in Mexico have been reconciled at levels of savings and investment that allowed satisfactory growth in output without the 1989–90 restructuring of debt? What are the likely implications of Mexico's "Brady deal" on economic growth? What are the macroeconomic effects of debt-equity swaps? This article develops and estimates a model to address these issues. The analysis concludes that the 1989–90 agreement in Mexico will contribute materially to macroeconomic stability and the restoration of economic growth.

On March 28, 1990, $48.9 billion of Mexico's commercially held debt was exchanged for new debt instruments that either implied a cut in principal, a cut in interest rates, or an obligation to increase exposure in Mexico by 25 percent. Such a rewriting of existing contracts should be undertaken only if this is the only way in which macroeconomic stability and growth can be restored. This article presents the analysis used to assess whether the debt agreement would indeed contribute to the restoration of economic growth in Mexico. (See van Wijnbergen [1991] for a description and analysis of the 1989–90 debt restructuring, otherwise known as the "Brady deal.")

The crisis leading to this agreement was indeed acute in Mexico. Between 1982 and 1988 Mexico's gross domestic product (GDP) did not grow at all, while Mexico transferred on average no less than 6 percent of its GDP to external creditors. Moreover the macroeconomic problems of that period triggered an increase in inflation of a magnitude not seen earlier in Mexico's economic history, in spite of an equally unprecedented fiscal adjustment program. Thus the issue was not just how to restore growth, but how to do so while maintaining a fiscal stance that would allow inflation to come down.

A brief historical overview sets out the developments leading to the situation immediately preceding the Brady debt restructuring in Mexico. Then a quantitative framework is applied to assess the limits on fiscal policy imposed by the macroeconomic targets embedded in the stabilization program initiated in 1988

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and the extent to which the recently concluded debt agreement relaxes them. Next a model is developed and estimated to determine whether satisfactory growth in output can be achieved within these constraints without jeopardizing external balance. The role of exchange rates and fiscal policy and the impact of external developments on growth and external debt in Mexico are discussed. The model is then used to assess the impact of the recently concluded debt agreement on Mexico's prospects for growth.

I. Stability, Expansion, and Collapse: A Brief Review of the Past

Between 1950 and 1974 real growth averaged 6.4 percent annually in Mexico, inflation was in single digits, and external debt accumulation was moderate. In the early 1970s rapidly expanding government involvement in the economy pushed up the rate of economic growth. However, increasing government expenditure was not matched by rising public sector revenues, and a decline in incentives prevented an adequate increase in private savings. As a result the inflation tax (the increase in nominal money balances necessary to keep the stock of real money constant) and external debt became increasingly important sources of finance.

Although sharp adjustment measures were implemented briefly in 1976, major oil discoveries and subsequent increases in the price of oil provided relief for fiscal and external problems. The government sector increased its share in value added by almost one-third, and the real exchange rate appreciated again, eroding the gains of the 1976 devaluation. This expansion was largely fueled from abroad: Mexico's external debt increased from $16 billion to $86 billion between 1975 and 1982, tripling in real terms.

In 1982 rising world interest rates and falling oil prices put an end to the expansionary policies. The subsequent cutoff from external capital markets after Mexico announced a moratorium on debt service in August 1982 left no option other than fiscal retrenchment. Mexico, which had run noninterest current account deficits in each of the preceding 30 years, suddenly needed to run surpluses. The ratio of external debt to GDP shot up anyhow under the influence of rising interest rates and falling growth rates. The gap between real interest rates on external debt and real growth in GDP went from −6.3 percent in 1980–81 to a full 10.5 percent in 1983. Differences this high meant that, even without deficits on the noninterest current account, the burden of debt increased rapidly, simply through the compounding effect of interest on debt inherited from the past. In addition came substantial capital losses on external debt resulting from the necessary depreciation in the real exchange rate. Real depreciation was unavoidable, given the decline in oil revenues and rise in real interest obligations, but it added 30 percentage points to the ratio of external debt to GDP during 1982 to 1987.

In 1983 a stabilization effort supported by the International Monetary Fund was implemented. Mexico's fiscal adjustment effort since then is probably un-

matched on a sustained basis in any country. The primary (net of interest) fiscal deficit, which was 7.1 percent of GDP before the crisis, turned within three years into a surplus of 5 percent of GDP, a surplus that increased further to an average of no less than 8 percent of GDP during 1988 to 1990. This turnaround was achieved even though revenues from oil exports declined by more than 7 percent of GDP. Noninterest government expenditure was reduced from 34 percent of GDP in 1982 to about 21 percent of GDP in 1989.

There was some expansion of the economy in 1984 and 1985, but the authorities adopted a new stabilization program in July 1986. This program called for renewed monetary and fiscal austerity and a concerted financing effort on the part of Mexico's external creditors. The 1986 package included new policy reforms designed to eliminate structural rigidities in the economy. The most significant change was a major reorientation toward exploiting the benefits of international trade.

The fiscal retrenchment since 1982 was partly brought about by a sharp cutback in the investment budget for the public sector, from almost 10 percent of GDP in 1982 to 4.5 percent of GDP in 1989. Private investment did not make up for the decrease in public sector investment. In response to the resulting decline in total investment and tight demand-management policies, growth stopped, and per capita income actually fell between 1982 and 1988. Inflation increased toward the end of the period, partially in response to a sharp nominal devaluation. This devaluation had become necessary because of the abrupt decline in oil prices in 1986. The subsequent de facto targeting of the real exchange rate, together with an increase in the frequency of wage and cost adjustments, introduced an element of instability into the system. This instability became more apparent toward the end of 1987, when the stock market plunge triggered a run on the peso. The run on the peso resulted in reserve losses and a 37 percent depreciation, which fueled inflation and expectations of further depreciations in the exchange rate.

In 1987 the Mexican government initiated a concerted effort to bring down inflation. Further fiscal adjustment was combined with an elaborate social pact involving wage and price controls in the private sector and wage and price restraint on the public sector after substantial price hikes up front. (To date, this effort to bring down inflation has been successful. The inflation rate, which averaged more then 70 percent during 1980–88, was about 20 percent during the second half of 1988 and all of 1989, and, after a relapse to 30 percent in 1990, is expected to fall well below 20 percent in 1991.) Nevertheless fears about sustainability lingered. Domestic interest rates remained well over 30 percent in real terms in the period preceding the debt negotiations, mostly due to uncertainty about the impact of the external debt on public finance and the exchange rate.

In July 1989 Mexico reached an agreement with representatives of its creditor banks to restructure most of its commercially held external debt. This agreement, which was implemented over the next eight months, reduced the net

transfer Mexico has to make to its external creditors by around $4 billion a year (van Wijnbergen 1991). The restructuring of the debt has taken substantial pressure off public finances and the external account and has allowed the modest restoration of growth that began in the second half of 1989 to continue.

II. CONSISTENCY OF FISCAL POLICY

A fiscal stance compatible with sustained low inflation is necessary, although possibly not sufficient, to allay inflationary fears. This section assesses the extent to which the debt package restored consistency between fiscal policy, inflation targets, and the objective of renewed growth.

The Financeable Deficit

There are three sources for financing public sector expenditure beyond revenues from the regular tax system: monetization, domestic interest-bearing debt, and external borrowing. The revenue from each source can be combined into the calculation of a financeable deficit (see Phelps 1973 and Sargent and Wallace 1982 for the theory underlying this approach to inflation, and Anand and van Wijnbergen 1989 and van Wijnbergen, Rocha, and Anand 1988 for the empirical application used here; refer also to Buiter 1988). A financeable deficit does not require more financing than is compatible with sustainable external borrowing, existing targets for inflation and growth in output, and a sustainable policy on internal debt. If the actual deficit equals the financeable deficit, fiscal policy is consistent with macroeconomic assumptions and targets. Of course, consistency with macroeconomic targets does not guarantee that they can or will be achieved; it implies only that the fiscal deficit is not inconsistent with them.

A simple model of the financial sector that incorporates reserve requirements and other bank regulatory policies is used to derive the demand for reserves by commercial banks. The demand for currency is derived from a model describing private portfolio choice as a function of inflation, output, and interest rates. The demand for reserves and the demand for currency are combined to estimate the total demand for base money, which is used to derive total revenue from monetization, net of interest payments on reserves, for different output growth rates, interest and inflation rates, and regulatory policies.

In Mexico the real interest rate on domestic debt, at almost 40 percent just before the debt package was announced, was well above the growth rate of the economy. In such circumstances, increasing domestic debt to finance the deficit would escalate debt service as a percentage of GDP. Therefore, in calculating the financeable deficit for Mexico, it is assumed that the real value of domestic debt remained constant.

Table 1 summarizes the results of the analysis. The required deficit reduction is the difference between the actual deficit and the financeable deficit: a decrease in the deficit equal to the required deficit reduction would restore the deficit to a level consistent with other macroeconomic targets. The operational deficit is the

Table 1. *Foreign Financing Options in Mexico in 1988 and the Deficit Reduction Required to Achieve a Financeable Deficit*

Case	Foreign financing (percentage of GDP)	GDP growth rate (percent)	Target inflation rate (percent)	Required deficit reduction (percentage of GDP)
1. Nominal value of foreign debt constant (in dollars)	0.0	1.5	0.0	5.1
	0.0	1.5	5.0	4.8
	0.0	1.5	15.0	4.4
	0.0	1.5	50.0	3.3
2. Foreign debt as share of GDP constant	4.0	1.5	15.0	0.4
3. Real value of foreign debt constant	3.1		15.0	1.3
4. Increased GDP growth rate with target ratio of debt to GDP constant	3.1	0.0	15.0	1.5
	4.0	1.5	15.0	0.4
	5.5	4.0	15.0	−1.3
	6.0	5.0	15.0	−1.9

Note: A financeable deficit is one that is compatible with sustainable external borrowing, existing targets for inflation and growth in output, and a sustainable policy on internal debt.
Source: Author's calculations.

deficit of the comprehensively defined public sector, which includes only real interest payments on domestic debt.

In the first case in table 1, the nominal dollar value of foreign debt is assumed to be constant. The 1988 operational deficit (4.4 percent of GDP) was in that case seriously out of line with inflation targets. For compatibility with an inflation target of 15 percent, the entire operational deficit would have needed to disappear. Mexico received very little from the inflation tax and more in general from *seigniorage*,[1] mostly because of low GDP growth at the time and the practice of paying interest on reserves. Even with a target inflation rate of 50 percent, the required deficit reduction would have amounted to 3.3 percent of GDP.

Increased access to foreign financing would have made a difference in the required deficit reduction. Case 2 in table 1 shows that, if enough foreign financing had been available to at least maintain a constant ratio of debt to GDP, the 1988 operational deficit would have almost been compatible with an inflation target of 15 percent (the required deficit reduction would have been only 0.4 percent of GDP). Case 3 illustrates a less liberal target, in which the real value of external debt is held constant, rather than allowed to rise with real GDP. The table indicates that the additional stringency would have required almost an additional percentage point of fiscal adjustment.

Case 4 in table 1 shows how, under a constant ratio of debt to GDP as a target

1. *Seigniorage* refers to the resources the government acquires through the issue of nominal money balances. Part of the increase in nominal balances just serves to keep the real value of money constant; this part is the inflation tax.

for foreign borrowing, fiscal leeway increases with growth in output. The required deficit reduction would have been 1.5 percent of GDP if the real GDP growth rate had been zero, and −1.3 percent of GDP if the real GDP growth rate had been 4 percent. Seigniorage increases with higher growth, as does allowable foreign borrowing, if a constant ratio of debt to GDP is the target. The actual need for adjustment might even have been less, as higher growth boosts tax revenues as a share of GDP because of the slightly progressive tax structure.

The message of the table is clear: absence of foreign financing can very well create a vicious circle. Less foreign financing requires fiscal cutbacks; if these cutbacks slow down growth—as mentioned, Mexico had to more than halve its public investment outlays between 1982 and 1988—substantially larger cutbacks are in turn required to maintain consistency with the same inflation targets.

Fiscal Implications of Debt Management

Debt management takes on great fiscal importance when differences in real interest rates between domestic and foreign debt are large. This can be illustrated by a scheme to swap public debt for private equity in which $10 billion in public debt is retired and a corresponding amount of domestic debt is issued by the public sector to acquire the private equity used in the swap. Because the difference in real interest rates before the Brady deal was 25 percentage points, such an operation would have increased the burden of the real interest rate by an amount equal to 1.5 percent of GDP, thus raising the required deficit reduction for a given inflation target correspondingly. The impact on the operational deficit would have been 1.2 percent of GDP. The model indicates that such a swap of debt for equity would have raised the equilibrium inflation rate (defined as the rate for which no fiscal adjustment is required) by no less than *50 percentage points*.

The figures in table 2 illustrate the extent to which high real interest rates are at the root of Mexico's current fiscal problems. In this exercise it is assumed that there is no net increase in the nominal value of foreign debt. The equilibrium inflation rate decreases as the real interest rate on Mexico's internal debt is decreased. Alternatively, as inflation rises, additional revenue from inflation tax falls, necessitating increasingly larger increases in inflation to cover a given increase in the operational deficit.

Table 2. *Equilibrium Inflation and the Real Interest Rate on Domestic Debt*
(percent)

Variable	I	II	III
Equilibrium inflation rate	150	22	0
Real interest rate on domestic debt	30	15	10

Note: GDP growth rate is 1.5 percent. There is no foreign financing.
Source: Author's calculations.

This table highlights that the secondary impact of the Brady package, through its impact on domestic interest rates, was in fact significantly more important from the point of view of fiscal consistency, than was the direct reduction in required foreign debt service.

III. Can Macroeconomic Stability, External Balance, and Growth Be Reconciled? A Quantitative Framework

Below is a simplified exposition of the model used to assess the likely impact of debt relief on economic growth in Mexico. The theoretical structure draws on van Wijnbergen (1985). The model parameters have been estimated econometrically and are reported in the next section.

Model Structure

The model focuses on intertemporal choice and the relative price governing it—the real interest rate. Both intertemporal production decisions (investment) and consumption decisions (savings) are endogenous. A second issue involves intratemporal rather than intertemporal trade; because foreigners spend less on Mexican goods on the margin than Mexicans do, any external transfer has immediate implications for the real exchange rate.

The aggregate supply of non-oil Mexican goods, y_S, depends on their relative price against foreign final goods (the real exchange rate, e), the real wage, w, the relative price of imported intermediate goods in terms of foreign final goods, P_M, and the stock of capital, K:

$$(1) \qquad y_s = y(e,w,P_M,K).$$

Adding oil revenues, R_{oil}, and subtracting interest payments on external debt, i^*B, yields national income $y = y_S + R_{oil} - i^*B$. Tomorrow's capital stock, K_{t+1}, depends on today's capital stock plus net private and public investment (I_P and I_G, respectively):

$$(2) \qquad K_{t+1} = K_t(1 - \delta) + I_P + I_G.$$

Aggregate expenditure consists of private consumption, C, private investment, I_P, and government expenditure, G. The real rate of interest is denoted by r, and y_A denotes after-tax income. Thus the current account surplus, CAS, can be written as

$$(3) \qquad \text{CAS} = \text{FS} + \text{NPS}(r,e) = \text{FS} + y_A - C - I_P$$

where FS is the fiscal surplus and NPS is the net private savings surplus. The private sector's surplus of savings (S_P) over investment (I_P), NPS $= S_P - I_P$, depends on the real rate of interest.

Until now, this article has focused on the current account, fiscal deficits, and the real rate of interest. But what about the real exchange rate? The approach adhered to views the real exchange rate as the relative price of Mexican (non-oil)

goods in terms of foreign goods. The "market" that the real exchange rate clears is the market for Mexican goods.

One component of the aggregate demand for Mexican goods comes from Mexican consumers (and investors). At a more appreciated real exchange rate, Mexicans will tend to allocate their aggregate expenditure toward foreign goods rather than toward Mexican goods. Similarly, an appreciated real exchange rate will cause lower export sales (X_d).

The aggregate supply of Mexican goods (y_S) increases when the real exchange rate appreciates, because intermediate imports will become cheaper in terms of Mexican goods. Thus commodity market equilibrium can be written as

$$y_S(e) = C_d(e,C) + I_{P,d}(e,I_P) + G_d + X_d. \tag{4}$$

Growth, Real Interest Rates, and the Exchange Rate

As long as domestic interest rates are not completely linked to foreign interest rates (plus expected exchange rate depreciation), changes in domestic real interest rates can resolve potential discrepancies between fiscal deficits and external targets through their impact on the net private savings surplus (that is, private savings minus private investment). The effect on private investment, and hence on the growth of output, is one of the more important links between fiscal policy and output growth embedded in the model. Figure 1 is based on the following identity:

$$\begin{aligned} \text{CAS} &= \text{FS} + \text{NPS}(r) \\ &= \text{FS} + S_p(r) - I_p(r). \end{aligned} \tag{5}$$

A higher real interest rate will slow down private sector investment and possibly increase private savings, thus increasing the net private savings surplus.

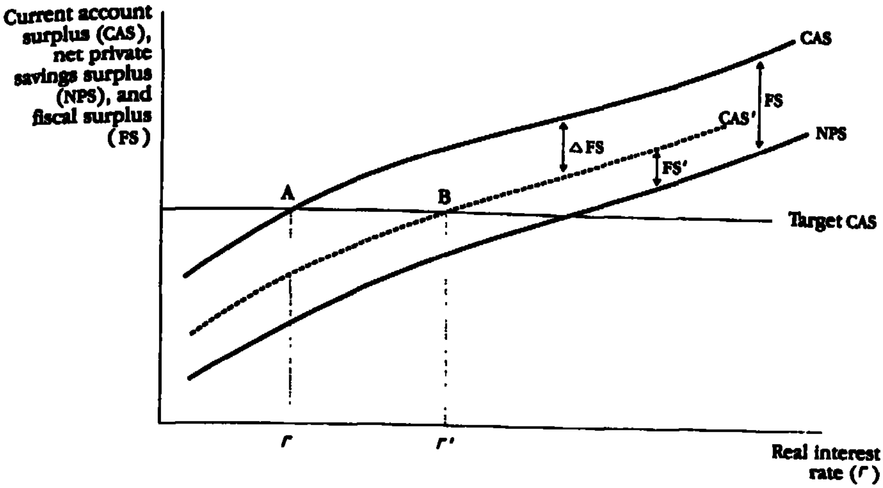
The net private savings surplus plus the fiscal surplus equals the external deficit that is compatible with given real interest rates and the fiscal surplus. The real interest rate at which the target value for the current account surplus equals the actual current account surplus is the real rate at which fiscal policy and current account targets are in line (r in figure 1, for current account target CAS).

An increase in the fiscal deficit (decline in the fiscal surplus, from FS to FS′) leads to a downward shift in the feasible current account surplus (from CAS to CAS′). An increase in the interest rate (from r to r') is needed to call forth the extra net private savings required. Conversely, with a cut in the fiscal deficit, a given current account target can be met with a lower real interest rate and hence higher private investment.

However, growth in output depends not just on private investment, but on the sum of public and private investment. The impact of changes in fiscal deficits on growth in output will depend on whether the underlying adjustment is made out of public investment or out of public consumption. The model therefore breaks down public expenditure into consumption and investment.

Arbitrage between domestic and foreign interest rates may eliminate any lee-

Figure 1. *The Current Account Surplus, the Net Private Savings Surplus, and the Real Interest Rate in Mexico*



way for the domestic real interest rate to reconcile fiscal deficits with current account targets. Because there is in fact evidence of a very high degree of capital mobility between Mexico and the United States, the empirical application presented in section V uses the model for given real interest rates, rather than fixing the fiscal deficit and having the real interest rate adjust endogenously.

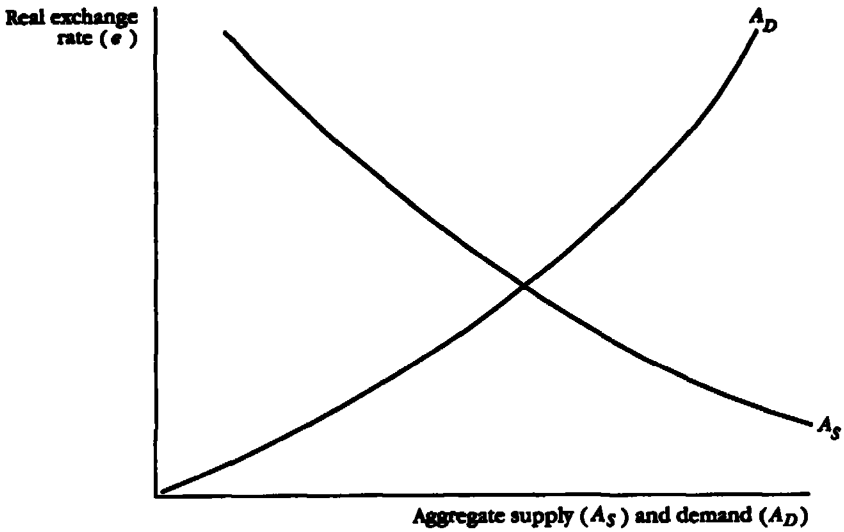
Commodity Market Clearing and the Real Exchange Rate

The real exchange rate can be viewed as the relative price of Mexican non-oil goods (hereafter referred to as Mexican goods) in terms of foreign goods. The real exchange rate clears the market for Mexican goods (possibly only after periods of disequilibrium); it is thus a static relative price in that it measures the rate at which two different (aggregate) commodities can be exchanged at a given moment in time.

Figure 2 illustrates the determinants of aggregate demand and supply in the market for Mexican goods (see Edwards and van Wijnbergen 1989 for a similar approach in a static framework). One component of aggregate demand for Mexican goods comes from Mexican consumers and investors. As the real exchange rate appreciates, Mexicans will tend to allocate more of their aggregate expenditure toward foreign goods rather than Mexican goods. Similarly, an appreciated real exchange rate will, all things being equal, cause lower export sales, as foreign demand falls off. This situation is represented by the upward sloping curve A_D.

The aggregate supply of Mexican goods is likely to increase when the real exchange rate (foreign over domestic prices) appreciates, because intermediate

Figure 2. *The Real Exchange Rate and the Market for Mexican Goods*



imports will become cheaper in terms of Mexican goods (as shown by the econometric evidence presented below). The aggregate supply curve A_S is therefore downward sloping.

The equilibrium exchange rate is the rate at which aggregate supply and demand for Mexican goods are in equilibrium (the intersection of A_S and A_D). When the real exchange rate is above the equilibrium level, there is excess demand for home goods, and output will be determined by supply: the exchange rate is undervalued (excessively depreciated). When the real exchange rate is below the equilibrium level, there is an excess supply of Mexican goods, and output is hence determined by demand: the real exchange rate is overvalued and there is Keynesian unemployment (van Wijnbergen 1986). An increase in government expenditure on home goods would shift the A_D curve down and so reduce excess supply and Keynesian unemployment problems. As a consequence, the commodity market clearing equilibrium real exchange rate would appreciate.

The Real Exchange Rate, Interest Rates, and the Current Account

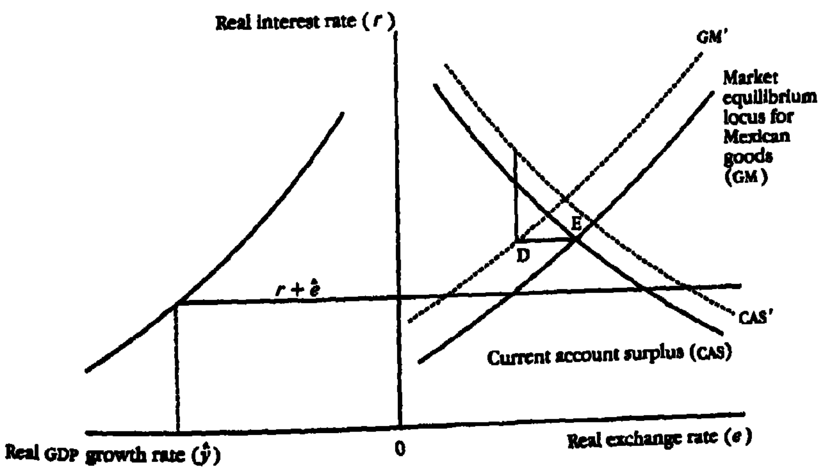
An external deficit indicates that aggregate expenditure by Mexicans on foreign and domestic goods exceeds aggregate income. It provides no indication, however, that aggregate demand by Mexicans and foreigners for Mexican goods exceeds aggregate supply of Mexican goods at the going real exchange rate. Various combinations of the real exchange rate and real interest rate will allow

the achievement of a particular current account target for given fiscal policy. Higher real interest rates will, other things being equal, reduce private consumption and investment and thus improve the current account balance. In which direction will the real exchange rate have to move to bring the current account into line with its target? Theory suggests, and the empirical analysis presented below confirms, that the answer is sometimes unclear.

For a constant rate of time preference the exchange rate has no effect on private consumption (Razin and Svensson 1983). Mostly because of its impact on intermediate import prices, a devaluation will have a negative effect on investment, but this effect takes place after a lag. In the short run, the only effect is the negative impact of a real depreciation on aggregate supply. Thus, in the short run, a real devaluation is in fact likely to deteriorate the current account (the current account curve slopes upward). In the longer run, because of the negative impact on investment, an appreciation will be necessary (the current account curve has a negative slope). Because this analysis focuses on the medium run, this article will concentrate on the case where the slope is negative (see figure 3).

What does this analysis suggest will happen if, because of inertial inflation and a fixed nominal exchange rate, the real exchange rate becomes overvalued? This possibility is represented by the move from E to D in figure 3. First, there will be an excess supply of domestic goods and hence falling exports, declining capacity utilization, and Keynesian unemployment. In the medium run a deterioration in the current account is likely according to the empirical analysis presented below. If the government responds to the rising unemployment and falling capacity utilization by raising government purchases of domestic goods

Figure 3. *The Effects of an Overvalued Exchange Rate in Mexico*



rather than devaluing, the market curve for Mexican goods shifts to the left (from GM to GM′ in figure 3), and the commodity market problem is resolved. If this fiscal expansion is not matched by increased revenues, however, the current account will deteriorate, and the current account curve will shift up (from CAS to CAS′). The upward shift means that the original current account target will increasingly get out of reach. Thus an overvalued exchange rate will lead to unemployment and possibly to a deteriorating current account as time goes by, or to no unemployment but a real current account problem if fiscal policy is used to offset the employment effects of the overvalued exchange rate. Thus the appropriate policy response to falling exports and sluggish capacity utilization is a real depreciation.

As in the preceding subsection, interest rate arbitrage takes away one degree of freedom: the real interest rate, for a given rate of depreciation, confines the economy to the line at $r^* + \hat{e}$ in figure 3. It also pins down the growth rate for a given public investment program (see the left half of figure 3).

IV. An Empirical Application to Mexico

This section presents an empirical application of the framework using Mexican data for 1965 to 1987.

The Real Interest Rate and the Market for Mexican Goods

The measure of permanent income is based on a simple trend regression of real disposable income, y_D, on time, t, with a trend break from 1984 onward because of the decline in 1983. Disposable income equals gross national product (GNP) minus government revenue plus the domestic real interest rate on government debt times the part of domestic government debt held outside the public sector.

$$\log(y_D) = \underset{(64.9)}{2.19} + (\underset{(21.3)}{0.063} - \text{D83PLUS}*\underset{(7.21)}{0.017})*t. \tag{6}$$

$R^2 = 0.96$, DW $= 1.58$, 1965–87 OLS

Permanent disposable income, y_P, is taken to be the predicted value of this regression in each year; the residual equals temporary disposable income, y_T.

Inflationary expectations are derived from a four-year moving average of actual CPI inflation rates. The predicted value of this weighting procedure is used to calculate real after-tax interest rates. The nominal rate used is the nominal, after-tax time deposit rate series presented in Gil-Diaz (1988) for 1965–86, and the three-month, after-tax time deposit rate for 1987.

Aggregate expenditure. With these definitions of temporary and permanent income and the real interest rate, the econometric results are given below for equations for the two components of aggregate expenditure that are sensitive to interest rates: private consumption and private investment. Expenditure for

private consumption depends on estimates of permanent and temporary disposable income and on the after-tax real rate of interest. Equation 7 presents the two-stage least-squares results for private consumption, C_P:

$$\text{(7)} \quad \log(C_P) = \underset{(25.6)}{5.18} - \underset{(1.83)}{0.44} \log(1 + r) + \underset{(4.41)}{0.70} * \log(y_T) + \underset{(12.2)}{0.86} * \log(y_P).$$

$R^2 = 0.97$, DW = 1.14, 1970–87 2SLS

The coefficient with respect to permanent income is highly significant, but not significantly different from one. The coefficient on temporary income is significantly lower than the coefficient on permanent income. And there is a significant (at the 10 percent level) and negative coefficient on the real after-tax deposit rate. However, the low value of the Durbin–Watson coefficient indicates some remaining specification error. The regression results deteriorated significantly when the real exchange rate was included; and because the real exchange rate variable never received significant coefficients, it was omitted.

The second component of aggregate expenditure that is sensitive to interest rates is private investment, or fixed capital formation. Private investment depends on real interest rates, the relative price of intermediate inputs, and the ratio of output to capital, as a proxy for capacity utilization, for which no data are available before 1980. The real interest rate used is based on the pretax nominal interest rate reported in Gil-Diaz (1988); this rate is converted into a real rate using expectations generated from a regression of inflation on its own past values going back three years, plus a constant term. The measure of intermediate imports prices is the unit value of intermediate imports (P_M) converted into pesos and deflated by the Mexican GNP deflator. The results of two-stage least-squares regression are as follows:

$$\text{(8)} \quad \log(I_P) = \underset{(0.80)}{0.75} - \underset{(2.64)}{0.60} * \log[1 + r(-1)] - \underset{(1.05)}{0.26} * \log[1 + r(-2)]$$
$$+ \underset{(7.18)}{1.59} * \log(y/K) - \underset{(2.12)}{0.30} * \log[P_{M(-1)}/P_{GNP}(-1)].$$

$R^2 = 0.95$, DW = 1.23, 1970–87 2SLS

The results show a strong negative dependence of private fixed capital formation on real interest rates and on the relative price of intermediate imports in terms of final goods. Both enter with a lag, as would be expected; private investment is actual investment expenditure, not orders. Inventory accumulation and total government expenditure are considered exogenous. These four components make up aggregate expenditure.

Aggregate supply. Aggregate supply of non-oil Mexican goods depends on the beginning of period capital stock, K_t; on the relative price of intermediate imports in terms of home goods, P_M/P_{GNP}; and on the relative final price of Mexican goods in terms of an index of foreign competitors' prices abroad,

P_{GNP}/P_f (an aggregate of the peso-based wholesale price index of Mexico's main trading partners, with 1980 export weights).

$$(9) \quad \log(y/K) = \underset{(2.15)}{-2.02} + \underset{(5.51)}{0.39} * \log(P_{GNP}/P_f) + \underset{(2.95)}{0.18} * \log[P_{GNP}(-1)/P_{f(-1)}]$$

$$- \underset{(1.64)}{0.13} * \text{PDL}\log[P_M(-1)/P_{GNP}(-1)]$$

$R^2 = 0.96$, DW $= 1.38$, 1974–87 2SLS

where PDL indicates a polynomially distributed lag. Equation 9 shows a strong positive response to the (inverse of the) real exchange rate: a real appreciation increases aggregate supply. Also, an increase in the relative price of intermediate imports or a decrease in the capital stock both lower aggregate supply.

Aggregate employment, N, depends on the real product wage, w/P_{GNP}, and on aggregate non-oil output (dlog$X$ indicates the log difference, $\log X - \log X(-1)$):

$$(10) \quad \text{dlog}(N_t) = \underset{(1.11)}{0.006} - \underset{(1.87)}{0.13} * \text{dlog}(w/P_{GNP}) + \underset{(5.22)}{0.54} * \text{dlog}(y).$$

$R^2 = 0.67$, DW $= 1.74$, 1966–87 2SLS

The elasticity of real wages is small, negative, and significant at a 10 percent level, and the elasticity of output is substantially less than 1 percent.

Next year's capital stock depends on this year's capital stock minus depreciation and on total fixed capital formation:

$$(11) \quad K_{t+1} = (1 - 0.04) * K_t + (I_P + I_G).$$

The depreciation rate of 4 percent is derived from government data, with some correction for the likely understatement of true depreciation in the national accounts in inflationary periods because of historical cost-accounting practices.

Allocation of Expenditure and the Real Exchange Rate

This section focuses on intratemporal trade; the relevant relative price variable is the real exchange rate. The allocation of domestic expenditure over foreign and domestic goods is analyzed by explicitly estimating import demand equations for the different import categories (capital goods, consumption goods, and intermediate imports); then the equation for export demand is specified.

The volume of capital goods imported, M_K, depends on the relative price of imports that are capital goods versus those that are investment goods in general (the GNP deflator for investment) and on aggregate investment:

$$(12) \quad \log(M_K) = \underset{(5.93)}{14.11} - \underset{(5.63)}{1.12} * \log(P_{M_K}/P_I) - \underset{(2.72)}{0.74} * \log[P_{M_K}(-1)/P_I(-1)]$$

$$+ \underset{(5.77)}{0.71} * \log(I_P + I_G) - \underset{(4.52)}{0.88} * M_R(-1).$$

$R^2 = 0.94$, DW $= 1.40$, 1970–87 2SLS

The variable M_R is the fraction of imports covered by quantitative restrictions; it is included in an admittedly crude attempt to capture the many changes in trade regime that have taken place in Mexico over the sample period. The results show relatively high elasticities, all estimated with great precision (high t-statistics). The trade regime variable picks up the degree of repressiveness of the trade regime in that it has a strong negative sign.

Consider next the volume of consumption goods imports, M_c:

$$(13)\quad \underset{}{\log(M_c)} = \underset{(0.94)}{2.34} - \underset{(4.85)}{2.12} * \log(P_{M_c}/P_{cpi}) - \underset{(2.70)}{1.23} * \log[P_{M_c}(-1)/P_{cpi}(-1)] + \underset{(4.15)}{1.31} * \log(C_P) - \underset{(2.54)}{0.96} * \log M_R(-1).$$

$R^2 = 0.82$, DW $= 1.54$, 1970–87 2SLS

The regression results indicate high and significant price elasticities and a strong negative impact of the proxy for trade intervention.

Demand for intermediate imports, M, equals

$$(14)\quad \log(M) = -\underset{(2.20)}{18.7} - \underset{(5.29)}{0.64} * \log(P_M/P_{GNP}) + \underset{(10.2)}{2.84} * \log(y) - \underset{(1.34)}{0.96} * M_R(-1).$$

$R^2 = 0.91$, DW $= 1.40$, 1970–87 2SLS

Equation 14 shows a somewhat lower, although highly significant, price elasticity and an unusually high income elasticity.

Total demand for Mexican goods by domestic residents in any given period can be deduced by combining the import demand equations with the equations for aggregate domestic expenditure and scaling by the relevant relative prices. To complete the analysis of commodity market equilibrium in the market for (non-oil) Mexican goods, an additional element is needed, however: foreign demand for Mexican goods, or export demand.

In the specification of the equation for export demand (X_d), it was assumed that Mexican exporters compete not so much with domestic producers in Mexico's export markets, but with other exporters to the same markets (primarily the United States and the European Economic Community). Thus the relevant activity variable is aggregate imports into Mexico's export markets (weighted by their share in Mexico's total exports), and the relevant relative price variable is the ratio of Mexico's export price over the aggregate price index of imports into Mexico's export markets. This yields

$$(15)\quad \text{dlog}(X_d) = \underset{(0.96)}{1.55} - \underset{(2.79)}{0.95} * \text{dlog}(X_P) - \underset{(0.40)}{0.12} * \text{dlog}[X_P(-1)] + \underset{(3.38)}{1.50} * \text{dlog}(M_v^*)$$

$R^2 = 0.59$, DW $= 2.56$, 1968–87 2SLS

where $X_P = (P_X/P_M)$ is the dollar price of Mexican non-oil exports over the aggregate dollar-based price index of imports into Mexico's export markets. M_v^* is the volume of imports into those markets (again, weighted by each country's share in Mexico's total non-oil exports). Analysis of the error structure suggested estimation in terms of rates of change rather than of (log) levels. The equation performs reasonably well: the price elasticities are significant, and the "income" elasticity is high and significant.

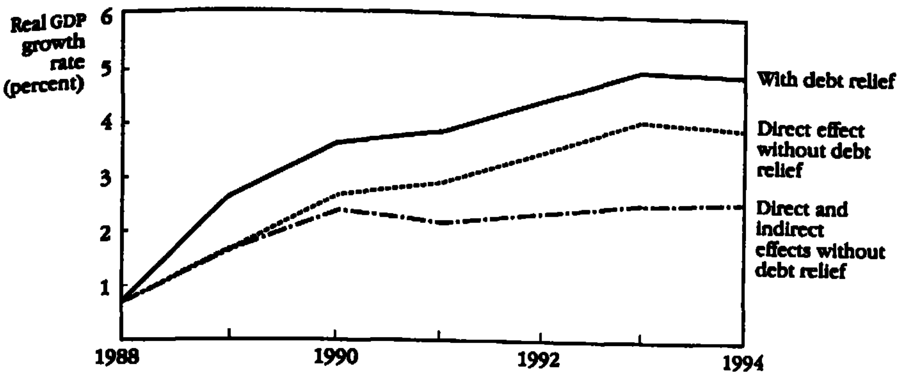
V. The 1989–90 Debt Package and the Recovery of Economic Growth

The debt relief package has reduced the net transfer Mexico needs to make to its creditors by almost $4 billion a year during 1989–94, or on average slightly below 2 percent of GDP. Half of this amount is due to the lengthening of maturity implied by the agreement, with the rest coming from lower interest payments and new money disbursements from the banks that decided not to choose one of the two options for debt service reduction. The reduction in required external transfers will have a direct beneficial impact on Mexico's fiscal situation and output. However, at least as important are the indirect, "secondary" effects of renewed confidence. A reduced net external transfer means reduced pressure on the exchange rate. Also, because this is a medium-term agreement, uncertainty about future exchange rates, financial regulation, and taxation has been reduced considerably. This situation greatly reduces the risk associated with peso-denominated, public sector debt. One should therefore expect domestic interest rates to decline. Developments since the details of the package became known in July 1989 support this argument. Nominal interest rates fell from 56 percent to around 36 percent on an uncompounded basis immediately after the details of the package became known; they fell further to around 25 percent toward the end of 1990.

Without the debt package Mexico would have had to service full interest and amortization on all public commercial debt out of a budget that was already severely cut back. Therefore, the government would have been forced to cut back public investment in line with the decline of "allowable" external net borrowing. The drop from the top line to the middle line in figure 4 indicates the direct impact on growth that this cutback in public sector investment would have had. In the simulations, benefits of the debt agreement are shown for 1989, even though the agreement was implemented in 1990. However, a number of policy changes implemented earlier would not have taken place if it had been known there would not be a debt agreement. This is in particular true of an important, fiscally costly accelerated depreciation scheme made effective in late 1988. The fiscal consequences of full debt service would have made such reforms impossible.

It is assumed that the government would have attempted to maintain its stabilization effort. It would then have been highly unlikely that domestic interest rates would have come down without a debt package. Therefore domestic

Figure 4. ***Projected Impact of Debt Relief on Growth of Output in Mexico, 1988–94***



Source: Author's calculations.

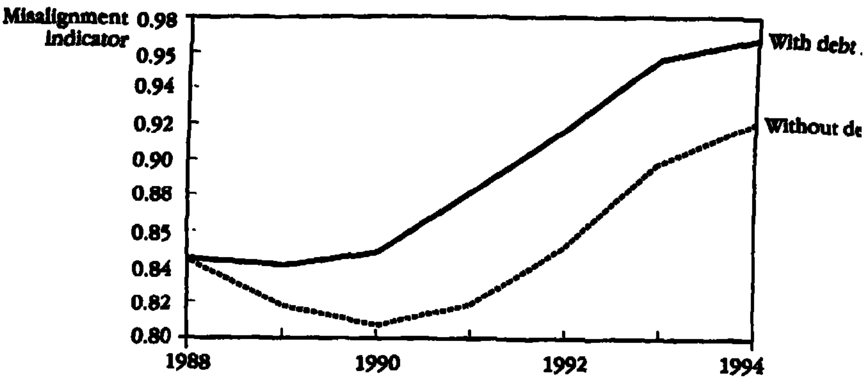
real interest rates stayed at 30 percent in this simulation; 30 percent is the value that prevailed on average in the year preceding the debt accord. Thus private investment would have declined because of higher real interest rates, compounding the negative impact on growth caused by the fall in public investment. This secondary effect would have caused the further decline in growth from the middle to the bottom line in figure 4.

Both effects would have had a major impact on growth. Growth in output would have been lower by one percentage point initially; the difference in growth would have deepened to more than 2 percent by 1994, as both private and public investment would have declined. During 1988–94 average growth would have been almost two percentage points lower, to reach only 2.6 percent of GDP by 1994. About half of the final slowdown in growth would have resulted from the impact that a failure to implement a debt agreement would have had on domestic real interest rates, which, in turn, would have reduced private investment. Not surprisingly, employment growth would have slowed down as well, by about one percentage point on average.

In this scenario, without access to external funds, a real devaluation would have been unavoidable. Devaluation of the real exchange rate is, of course, the main channel through which uncertainty on the external debt situation influences domestic real interest rates. Figure 5 indicates the importance of debt relief for the real exchange rate.

Figure 5 gives the value of a qualitative real exchange rate misalignment indicator with and without the debt package. The indicator equals the ratio between aggregate demand for domestic goods (by foreigners and Mexican nationals alike) and capacity output. This variable can be different from one if the model is run with a predetermined real exchange rate. A number less than

Figure 5. *Projected Exchange Rate Misalignment Indicator, 1988-94*



Note: An indicator value of less than one corresponds to overvaluation.
Source: Author's calculations.

one corresponds to overvaluation in the sense that a real depreciation would needed to clear the commodity market. The figure clearly shows the extent which debt relief is likely to take pressure off the exchange rate by raising real exchange rate compatible with planned policy settings.

If, instead of fully servicing debt obligations, principal were rescheduled l interest fully paid, the net marginal impact of the debt package on growth wo still be substantial. In that case the direct transfer effect would be halved, fo total of less than 0.5 percent a year instead of slightly under 1 percent a year. I a pure rescheduling exercise would leave a substantial financing gap ($1(billion), so no favorable domestic effects should be expected from reschedul alone. Accordingly, the full secondary impact of the debt agreement through impact on domestic real interest rates and investor confidence would not affected. Thus, even judged against this less extreme alternative, one would s expect a net marginal effect of the debt agreement on GDP growth of around percent a year during 1989–94.

Such econometric results should be interpreted with caution; however, i well-defined, formal sense, they represent the best use of currently availa information. Based on these results a clear conclusion emerges: the debt pack does meet the minimum requirements for restoring growth.

VI. Conclusions

This article has presented a model to analyze the interaction between fis policy, real interest rates, and the real exchange rate. The model was estima for Mexico and used to analyze the impact of the recently concluded d agreement on Mexico's prospects for economic growth.

Without renewed access to foreign capital markets, Mexico would have fa

a grim fiscal situation. As demonstrated, without a net nominal increase in foreign debt or an equivalent cut in scheduled debt service, and at preagreement interest rates, a target of 15 percent inflation would have required an increase of more than four percentage points in the noninterest surplus for fiscal consistency. The primary surplus in 1988 was already extraordinarily high at 7.6 percent. An increase of four percentage points would have been equivalent to scrapping the entire public sector investment program. An adjustment this large would clearly have been impossible after the massive fiscal retrenchment that had already taken place in the preceding years.

As demonstrated further, servicing the face value of the current debt without substantial amounts of new money would have been incompatible with renewed growth in output. The analysis suggests that the recently concluded debt agreement between Mexico and its creditors brings restoration of growth within reach, leading to cautious optimism about the prospects for recovery of growth in Mexico.

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A Symposium on Tax Policy in Developing Countries

This symposium draws on papers presented at the World Bank Conference on Tax Policy in Developing Countries, held in Washington, D.C., in March 1990. The articles in the symposium were refereed in the usual way. The Editorial Board invited the organizers of the conference, Javad Khalilzadeh-Shirazi and Anwar Shah to write the introduction to the symposium.

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Introduction: Tax Policy Issues for the 1990s

Javad Khalilzadeh-Shirazi and Anwar Shah

In recent years, in the wake of fiscal crisis, developing countries have increasingly begun to restructure their tax systems to seek higher revenues or to improve the revenue elasticity and buoyancy of the tax structure (Chhibber and Khalilzadeh-Shirazi 1988). These reform movements have also aimed to eliminate the disincentive effects of onerous levels of taxation, to reduce the economic inefficiencies induced by the distortionary taxation of assets and sectors, to protect the poorest of the poor from the tax net, and to provide partial relief from the unwelcome effects of inflation.

This introduction to the following articles on tax policy first gives an overview of tax reform in developing countries. It then distills lessons for tax reform from past developing-country experiences and reviews selected issues that are expected to dominate tax policy research and discussions in the 1990s. The five other articles in this symposium provide an in-depth review of applications of tax policy models in developing countries and analysis of tax policy toward foreign direct investment, taxation of agricultural land and financial assets, and the redistributive impacts of various taxes.

I. Tax Reform in Developing Countries

Many developing countries have undertaken tax reform in recent years. Their successes and failures can provide guidance for countries in similar circumstances, which may now or in the future attempt to reform their tax systems. Tax reform in these countries has varied in substance, process, context, and timing. For example, in Colombia, the Republic of Korea, and Turkey there was a long drawn out period of tax reform. In Indonesia and Malawi major changes in the tax system were implemented in a single episode over a short period. A review of these experiences provides some coherent themes about the current status and future directions of tax reform and points to some unresolved issues that will continue to invite controversy and debate in the coming years.

Directions of Reform

The emphasis on the redistributive role of the tax system is gradually waning, as a direct consequence of pervasive tax evasion. Theoretically progressivity

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remains high on the political agenda. However, the political will to enforce income tax compliance is often lacking. Vertical equity is increasingly being perceived as an elusive goal and, therefore, is being assigned a lower order of priority in tax reform.

Trade liberalization policies in many developing countries have resulted in a persistent and discernible trend toward reduced reliance on narrowly based trade taxes. To overcome revenue shortfalls associated with such policies, there has been increased emphasis on broadly based, hybrid value added taxes. To reduce the disincentive effects of taxation, average and marginal effective tax rates are being brought down by broadening tax bases through the elimination of ineffective tax preferences while leveling the rates. These measures, however, compromise vertical equity. The protection of the poorest of the poor has been attempted by exempting or zero rating foods under a value added tax (VAT) and by raising the threshold of personal income, urban property, and agricultural land taxes.

Distortions between sectors and between assets are being reduced by eliminating special preferences and replacing cascading turnover or sales taxes by more neutral VATs. In Latin America there have been attempts to mitigate the unwelcome effects of taxation in highly inflationary economies by partially indexing the tax system. Regional and international tax competition to attract foreign investment has been intense.

Although broad directions of reform are remarkably similar, several unresolved and controversial issues remain. For example, all recent attempts at tax reform have curtailed tax preferences, especially for investment. But some economists would argue that some tax incentives, such as the investment tax credit, are desirable because they lower the user cost of (new) capital and thereby encourage greater capital formation.

The proper role of progressive income taxes in developing countries is also subject to much controversy and debate, as is the advocacy of fewer tax brackets and rates for the personal income tax for the sake of simplicity. Moreover there is a trade-off between simplicity and progressivity. Perplexing philosophical and transitional issues continue to dominate the issue of replacing income taxes by broadly based consumption (expenditure) or cash flow taxes. Broadly based consumption taxes in their pure form would tax wage income only (Zodrow and McLure 1988). Because capital income is not taxed, except for rent, the equity implications of such taxes would invite considerable controversy and debate. Cash flow taxes would be, in principle, simple to design, and they are conceptually superior to the existing income taxes—especially the corporate (equity) income tax in a closed economy. In open economies the noncreditability of cash flow taxes under the existing foreign tax credit regimes and their unsuitability as withholding taxes discourage consideration of adopting cash flow taxes in developing countries. Moreover implementation is currently considered to be so difficult that no country has yet adopted such a tax (except in enclaves such as mining).

Lessons for Tax Reform

A review of tax reform experiences offers some important insights into tax policy design and institutional development. Here we describe several important lessons for tax reform in developing countries.

Using the VAT. The VAT should be the instrument of choice for most developing countries contemplating reform of their sales taxes. The revenue enhancement and tax neutrality (economic efficiency) arguments in favor of a VAT are well documented. Vertical equity is also enhanced through the trade component of a VAT, which reduces rents accruing to the wealthy recipients of import or foreign exchange licenses. A VAT can further help improve the collection of other taxes. This potential, though, has yet to be exploited by a developing country. A VAT, however, is not necessarily superior to a well-functioning retail sales tax in small, island-type economies. And it is not suitable for administration by levels of government other than the central government.

Broadening tax bases. The tax base of existing taxes should be broadened when taxes are reformed. This would enhance revenue and improve the simplicity, neutrality, and equity of the tax system. Neutrality is enhanced because broadening the tax base usually reduces different tax treatment among assets and sectors of economic activity. Vertical equity is enhanced because tax expenditures that offer disproportionate levels of benefits to the rich are curtailed.

Setting lower and fewer tax rates also enhances neutrality objectives but is not compatible with vertical equity objectives. And broadening the base of existing taxes and having fewer and lower rates continue to be compromised by difficulties in tax administration. Lack of success in this area is attributable to selective and lax enforcement; ineffective tax administration, in part from political inertia; institutional and political difficulties associated with bringing agricultural incomes into the tax net; and an overall disenchantment with income taxes as revenue instruments in an evasion-prone environment.

Limiting special tax preferences. The provision of special tax preferences through the tax system often drains the national treasury by conferring windfall gains on existing activities or through shifting resources away from nontax-preferred activities. Thus, in devising tax policies to meet economic and social objectives, potential gains must be weighed against the potential losses in efficiency and the revenues that might be associated with these measures.

Recognizing initial conditions. The design of tax reform must reflect initial conditions at home and abroad. In reforming their tax systems, developing countries are severely constrained not only by their own institutional settings but also by the tax structure in capital-exporting countries. For example, the U.S. foreign tax credit regime discourages developing countries from adopting a cash flow system of taxation. And in developing countries there would probably be serious transitional difficulties if tax systems were redesigned from scratch.

Improving credibility. The credibility of the tax regime is key to the success of any tax reform. A stable tax policy environment encourages businesses to take a longer-term perspective in their finance and investment decisions. Tax changes should be made after transitional arrangements have been adequately considered, and they should be presented as part of a long-term strategy. Establishing business confidence in the credibility of the tax regime requires greater attention to preparation, analysis of reforms, advance consultation, and provision of a reasonable period of adjustment before implementation.

Coordinating tax reform. Coordinated tax reform offers significant advantages over isolated piecemeal tinkering with the tax system. A coordinated reform ensures consistency of individual tax changes with the overall objectives. Thus the objectives of both protection (through custom duties) and revenue enhancement (through a sales tax and a VAT) could be secured. For example, reduction in tariffs without a corresponding increase in other taxes, generally of a value added type, can increase the fiscal deficit and exacerbate macroeconomic difficulties. To enhance overall economic performance, tax reform should be integrated closely with overall structural adjustment measures.

Political Economy of Tax Reform

In developing countries tax reform initiatives are usually seriously considered only when there is a major fiscal crisis. In theory, comprehensive reforms would enable the tax system to meet the objectives of revenue, efficiency, equity, growth, and simplicity. In practice, because the gains from comprehensive reforms become visible only in the medium to long term, it is difficult to get politicians to commit themselves to a comprehensive reform. Therefore often the most pragmatic course is to strive for periodic, incremental reforms.

However, it is difficult to maintain tax reform. For example, in Colombia, although a net wealth tax was considered an important progressive element of taxation in the 1974, 1986, and 1988 reforms, it was repealed in 1989. Similarly, the broadening of the base of income taxes, when accompanied by the lowering of tax rates, does not invite significant opposition. If, however, after introducing these changes, tax preferences are later restored to appease special interests, the initial tax reform effort would have contributed to tax "deform" (deterioration of the tax structure) because, in the final analysis, lower rates would be applicable to still narrower bases (see Thirsk, forthcoming). Broadening bases and lowering rates can also lead to tax "deform" in an environment in which tax evasion is pervasive.

Tax changes create winners and losers. Also each tax change introduces some efficiency and vertical equity trade-offs that must be recognized and appropriately addressed. In developing countries the regressivity of the VAT is dealt with by using exemptions. It is important to identify gains and losses by income class, by geographic region, and by political affiliation so that the long-run viability and sustainability of the reform measures can be objectively evaluated.

Country experiences suggest that tax reform proposals must carefully consider the institutional features of each country. For example, in low- to middle-income countries, such as Colombia, Indonesia, Malawi, and Turkey, large revenue gains are not expected from the broadening of income taxes, and therefore the VAT is expected to be the mainstay of the revenue-raising effort. However, in newly industrial countries, such as Korea, there is considerable potential for enhancing revenue by broadening the tax bases. In a federal country, the way powers of taxation are assigned among levels of government typically constrains tax reform choices. For example, in India the introduction of a federal VAT is being opposed at the state level. States are worried that a federal VAT would not leave much room for state and local sales taxes. In Pakistan the *octroi* tax, which is a tax on intermunicipal trade, could not be repealed because it is a significant source of local revenue.

Tax administration plays a key role. Experience suggests that compartmentalizing public policy in various departments (or even various branches of the same departments) limits tax reform options. In addition, the local political and civil service elite in the country must assume the "ownership" of the proposals if the reforms are to succeed. Further, participation by local experts in designing the reform enhances the chances for its success.

A public debate on the reform proposals, which would indicate which popular expenditure programs would be at stake, would help induce compliance. A coherent overall plan should be in place before implementation, and tax reforms must remain flexible to respond to changing economic and social conditions.

II. Selected Tax Policy Issues for the 1990s

Although a review of past reforms is helpful, it offers little guidance on a number of emerging tax policy issues. Several issues are emerging, some of which are analyzed by the authors of the articles that follow.

Optimal Taxation versus Optimal Tax System

Ramsey (1927) argued that the efficiency cost of taxation could be minimized under a system that equalized the deadweight loss per unit of tax revenue for all commodities. Under certain strong simplifying assumptions, this argument is expressed as an "inverse elasticity rule," in which the tax rate is inversely proportional to a commodity's own compensated elasticity of demand (Slemrod 1990, p. 159). Diamond and Mirrlees (1971) assume either constant returns to scale or 100 percent profit taxation (fairly unrealistic assumptions) to demonstrate that commodity taxation alone can ensure production efficiency and that the use of taxes on capital income, tariffs, and investment incentives would be inconsistent with production efficiency requirements.

Deaton (1987) notes that calculating optimal commodity tax rates under the above rule requires global knowledge of preferences both in the present period and intertemporally. Since this is an unattainable proposition, this result is not

operationally significant (see also Feldstein 1978). Optimal commodity tax rules further assume the absence of other tax instruments. If income tax is available, for example, the usefulness of the inverse elasticity rule is further clouded (Atkinson and Stiglitz 1976; Stern 1987). Slemrod (1990) argues that once the literature on optimal taxation abandons the assumption of a representative consumer and admits redistributional considerations, then optimal commodity taxes should vary by the circumstances of the individual—a completely impractical proposition.

Slemrod (1990) has argued that the optimal tax theory can serve as a guide to designing "optimal tax systems" only if it considers the technology of tax collection. This technology would include the feasibility of tax instruments and the cost of tax administration and compliance. Most analyses of tax reform in developing countries assume the infeasibility of agricultural income and land taxation. Under an optimal tax system one would equate the marginal excess burden of taxes to the marginal administrative cost, and therefore such extreme assumptions could be avoided. Thus optimal tax considerations for differentiated rates must be weighed against the administrative feasibility and cost of such a system. Similarly the marginal resource cost of enforcement must be equated to its marginal social benefits. Thus tax administration limits tax policy choices and also plays a vital role in the success or failure of attempts to reform taxes.

Fiscal Federalism Dimensions of Tax Reform

The way taxing and spending authorities are delineated can have important implications for tax reform. Thus the multilevel government dimension of the tax system should be addressed in developing tax reform proposals.

In India sales taxes are assigned to the state level, excise taxes are administered by the central government (which shares proceeds with the states), and taxes on intermunicipal trade are administered locally. As a measure to reform the existing structure of sales taxation, a broadly based VAT to be administered by the central government has been proposed. However, such a measure can not be implemented because of strong opposition by states. The states are also dissatisfied with the central administration of excises, which does not allow the states to vary revenues and rates from this source. The central government has been tempted to raise additional revenue from administered prices rather than excises because the proceeds from the latter have to be shared with the state governments. The *octroi* tax is a source of significant revenue for local governments. Thus it remains a popular tax at the local level in spite of its antitrade bias (Shah 1991a).

The constitutional assignment of sales taxes in Brazil has created similar difficulties. All three levels of government have partially overlapping responsibilities to develop and administer policy for value-added type taxes. The federal government is responsible for a sales tax on manufactured goods. The municipalities can levy a VAT on services. The states have the mandate of a general VAT, whose base encompasses the bases for federal and municipal sales taxes. This

multiplicity in administration raises the administration and compliance costs of these taxes. Further, Brazil is the only country in the world with a state-level general VAT. This has the potential of evolving into a tax with multiple rates on nonuniform bases (Shah 1991b).

The issues discussed above are particularly acute in enterprise taxation in nonmarket economies. The revenue from such taxes is usually collected at the local level and shared with higher levels of government. This creates incentives for lax administration of enterprise tax (a shared tax) at the local level but more active administration of local charges and fees (nonshared revenues) levied on enterprises.

The Design of Indirect Taxes

In most developing countries the design of indirect taxes plays a central role in the ability of governments to raise revenue without major distortionary economic impacts. Two key issues are coordinating the reform of tariffs and domestic indirect taxes and designing a VAT. Mitra (forthcoming) argues that tariffs should not be reformed without reforming other indirect taxes because potential losses in public revenue arising from reduced tariffs need to be offset so as not to exacerbate macroeconomic difficulties. A coordinated reform of these taxes would combine reductions in tariffs with an offsetting or, preferably, revenue-enhancing upward adjustment in the sales tax or VAT, which would apply equally to both domestic production and imports. Revenue neutrality can be preserved under this scheme, or the sales tax rate structure can be raised to meet the demand for any assistance for trade liberalization that may become necessary.

As noted earlier, the introduction of a VAT is the most pervasive feature of tax reform in many developing countries. Experience offers several insights for other developing countries. First, preretail VATs cause significant amounts of distortion and administrative complexities and therefore are not worth adopting. Second, all services (except health care, education, social welfare, banking, and insurance) should be included in the base. Third, rate differentiation should be minimized, although protecting the poor may warrant reduced rates for food, essential consumer items, drugs, electricity and fuel, newspapers and books, and public transportation. If luxuries are to be taxed at a higher rate, then special excises should be levied rather than increasing the VAT. Fourth, the VAT is an ideal tax for large, integrated economies with sophisticated production and distribution channels. It is less suitable for small, island-type economies that have a narrow manufacturing base and that depend heavily on cross-border trade.

Corrective Taxes

The theoretical case for corrective taxation has been amply demonstrated in the economic literature; yet it has been neglected in tax policy discussions in developing countries. Summers (1991) has argued that using corrective taxes to

protect the environment or to discourage "sins and bads" (through taxes on cigarettes, alcoholic beverages, and so forth), and rent seeking also raises a significant amount of revenue. For example, a tax at a rate of $10 per ton of carbon contents of fossil fuels, if imposed by the United States alone in 1991, could raise $13 billion a year at a deadweight loss of only $100 million. A global carbon tax of the same order could raise roughly $50 billion in government revenue. A global tax, however, raises questions about the resource transfer associated with alternatives for revenue disposition and the implications of such a tax for the growth and international competitiveness of individual developing countries.

Tax Expenditures

Governments in developing countries often rely upon the tax system to further social and industrial policy objectives. A wide variety of incentives are used to implement these objectives. However, often insufficient attention is paid to the consistency of the incentives with the stated policy objectives. As a result cost-effectiveness of such measures escapes public scrutiny.

Major tax expenditures in developing countries are typically in the areas of investment and savings promotion. Investment incentives through the tax system include tax holidays, investment tax credits, accelerated depreciation allowances, lower tax rates, and tax rebates. Nontax incentives include publicly subsidized utilities, cash grants, and technical assistance. Of these incentives only investment tax credits, accelerated depreciation, and tax rebates are often automatically granted; the others are subject to varying degrees of administrative discretion. Properly designed investment incentives play an important role in stimulating investment. Investment incentives can offset the corporate tax distortion, attract foreign investment, create employment, promote risk sharing, and correct information asymmetries (Shah forthcoming). However, administrative discretion often discourages potential investors, especially nonresidents.

Developing countries offer a wide variety of savings incentives through the personal income tax system. The relative efficacy of these incentives in relation to investment incentives remains an unexplored area of research for developing countries. The experience of industrial countries suggests that investment incentives are superior to savings incentives in stimulating capital formation. Investment incentives in a life-cycle framework redistribute from the old to the young and thereby reduce current consumption and increase current investment. The same is not true of savings incentives (Auerbach and Kotlikoff 1989; Summers 1981). In general considerable controversy surrounds the effects of taxation on savings.

Taxation of Foreign Investment

Perceptions regarding foreign investment in developing countries have changed rapidly in recent years. Developing countries have come to recognize that positive economic gains can be associated with foreign capital, particularly

technology transfers and access to world markets. This realization has sometimes led to fierce competition among developing countries to provide tax incentives to attract foreign capital. However, in many instances such incentives may simply transfer resources from the host developing country to foreign treasuries without providing any special benefit to foreign investors. Thus the taxation of multinationals by a developing country cannot be examined in isolation from the tax regime of the home country, from tax havens and conduit countries, or from transfer pricing practices. These factors will have a bearing on the tax sensitivity of foreign direct investment (FDI).

Recent theoretical work by Leechor and Mintz (forthcoming) indicates that home country taxes influence the user cost of capital, even when retained earnings are used at the margin. In addition foreign firms in a typical host country face substantial variations in the user cost of capital depending on the country where capital is owned, the type of organization, the rate of remittance, financial policy, and the net foreign tax credit position. Leechor and Mintz's calculations for Thailand show that effective tax rates vary depending on the source of funds, on the type of organization, and on rates of remittances. They argue that the policy options of the host country are usually constrained by the tax rules in capital-exporting countries and by the strategic behavior of multinationals. They conclude that, given international capital mobility, tax neutrality on a global basis is possible only through a comprehensive multilateral agreement on the coordination of capital income taxes.

In the literature the disincentive to invest that is caused by the tax system is usually implicitly measured by an average tax rate. But the incentive to undertake new investment depends upon the effective marginal tax rate, which can deviate substantially from an average tax rate concept. Shah and Slemrod (this issue) empirically examine the relevance of host and home country tax regimes to FDI using data on U.S. multinational transfers and reinvestments in Mexico. Their empirical model distinguishes FDI financed by transfers from that financed by retained earnings. It incorporates tax and nontax factors for both the host and the home country, including host country risk factors and the credit status of multinationals. Both the marginal and the average effective tax rate formulations are incorporated into the analysis. They conclude that FDI in Mexico is sensitive to tax regimes in Mexico and in the United States, to the credit status of multinationals, to country credit ratings, and to the regulatory environment.

Taxation of Agricultural Land

Agricultural income in many developing countries is brought into the tax net indirectly by distorting taxes on agricultural exports, by marketing boards, and by overvalued exchange rates. The possibility of replacing these with a nondistorting land tax is examined by Skinner (this issue). He examines the merits and demerits of the land tax, both in theory and in practice, in selected developing countries. He concludes that a land tax is not necessarily a superior alternative to export taxes for raising federal government revenue because its design is

too inflexible to deal with the instability in agricultural incomes and with administrative and political difficulties. He argues that progressive tax rates on land holdings are nearly impossible to administer, by citing the example of Bangladesh, where the top marginal rate on the wealthiest farmer's land is nearly 50 times the minimum rate. In reality there is little or no evidence that rich farmers pay more than three times the minimum rate.

Skinner further argues that the record to date suggests that land taxes have not been effective in attaining nonrevenue goals. Such goals would include transferring resources from the agricultural to the nonagricultural sectors, discouraging inefficient or speculative land use, assisting in land reform, and promoting environmentally sound land management. A land tax, however, is a suitable instrument for local government financing because it would be seen as a benefit tax or simply as a user charge for local public services.

Taxation of Financial Assets

Developing financial markets is commonly considered to be a key element in growth strategy. Most developing countries consider their banking, insurance, and finance sectors to be lightly taxed. Chamley (this issue), however, argues that the financial sector in many developing countries is heavily taxed if one includes both explicit and implicit taxes in the analysis. Implicit taxes for this purpose include seigniorage, reserve requirements (earning below market rates), lending targets at nonmarket rates, and interest ceilings combined with inflation. These taxes are never reported as tax revenues in standard national accounts but yield revenues far in excess of traditional taxes. Inflation is often overlooked as a source of tax revenue.

Using a partial equilibrium framework, Chamley argues that most of the incidence of the effective taxation of financial institutions falls on deposits. Although the revenue from taxation of financial assets is difficult to measure because of the complexity of the instruments, its efficiency cost is very large when the rate of taxation is greater than 40 percent. At lower rates, for example, less than 20 percent, the efficiency cost is lower in relation to revenue. Removing onerous levels of taxation stimulates financial intermediation if such a move is seen as a permanent policy change. The results vary by the initial conditions (tax rates, level of development, and inflation rate) and the credibility of the tax regime that is observed in each country. For example, in countries that have relatively developed financial markets and in all countries that have annual inflation rates above 100 percent, the supply of financial assets is highly responsive to tax changes, provided the policy change is seen as credible. As countries develop a large and sophisticated menu of financial assets, such as Indonesia and Thailand, greater possibilities for substitution emerge, which produce higher efficiency costs of financial taxation. Most countries in Latin America and Southeast Asia and Ghana, Somalia, Uganda, and Zaire in Africa either experience high inflation or have sophisticated financial systems. In these countries the reduction in the level of financial assets in the formal sector that is associated

with implicit taxes is estimated to outweigh the revenue gains from such taxation. The impact of taxation is estimated to be significantly weaker in countries with inflation rates of 60 percent or lower, such as Niger, Tanzania, and Zambia.

The Distributional Impact of Taxation

The incidence of various taxes has been the subject of considerable controversy and debate. The central theme of Shah and Whalley (this issue) is that tax incidence analysis for developing countries continues to be based on the same assumptions about tax shifting that are used in studies of industrial countries. However, developing countries typically have very different nontax policies and regulatory environments from industrial countries, with features such as higher protection, rationed foreign exchange, price controls, black markets, and credit rationing. For several taxes, taking such features into account can substantially change estimates of incidence from those that would be produced by conventional thinking. The authors present calculations for Pakistan on the incidence of selected taxes.

Quantitative Tools for Tax Policy Analysis

A quantitative evaluation of the impact of changes in tax structures is essential for reasons of economics as well as political economy. Dahl and Mitra (this issue) draw upon the work done by the World Bank in analyzing taxes in Bangladesh, India, and China and illustrate how applied general equilibrium analysis can help to address a wide variety of questions in tax policy analysis. The Bangladesh model, for example, combines revenue and incidence effects in a single measure to rank various sectors with respect to the efficiency and equity costs of raising revenue. The China model evaluates whether it is appropriate to recommend that socialist economies should adopt broadly uniform tax rates for large numbers of sectors. The India model examines the coordinated reform of tariffs and indirect taxes. The authors further discuss the resources required to carry out such analyses. They argue that establishing a consistent data set is the costliest element of modeling and that computing and software costs are small by comparison. They suggest that cost considerations must be weighed against the substantial gains that model analyses make possible in producing consistent recommendations and formulating sound policy decisions on structural reform.

III. Concluding Remarks

Recent research has yielded important insights on tax policy issues for developing countries. The success of tax policy changes depends heavily on the administrative ability (and, of course, the political will) to collect revenue through fair and efficient enforcement. This is reflected in all recent efforts at tax reform that emphasize the simplicity of tax design and the ease of its administration as the fundamental criteria for choosing among alternative proposals. Unfor-

tunately, in this area both a framework for evaluating alternative policies in terms of administrative efficiency as well as estimates on the relative orders of magnitudes of marginal administrative costs of various tax instruments are scarce. Additional theoretical and empirical research on the efficiency of tax administration can potentially yield important insights for tax reform. A better theoretical and empirical understanding in this area could ensure that the criterion of simplicity in the design of tax reform is put in appropriate perspective and not overemphasized at the expense of equity and other policy objectives.

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Do Taxes Matter for Foreign Direct Investment?

Anwar Shah and Joel Slemrod

The tax sensitivity of foreign direct investment (FDI) has important policy implications. If FDI is not responsive to taxation, then it may be an appropriate target for taxation by the host country. This question is examined for Mexico by estimating the response of FDI from retained earnings and transfers from abroad to the tax regimes in Mexico and the home country, the credit status of multinationals, country risk factors, and regulatory and trade regimes in Mexico. FDI in Mexico is found to be sensitive to the tax regimes in Mexico and the United States, the credit status of multinationals, country credit ratings, and the regulatory environment. Thus Mexico's current policies to dismantle regulations and employ a tax system competitive with the United States are expected to have salutory effects on FDI in Mexico.

The 1980s have seen a remarkable growth in foreign direct investment (FDI), which has sparked a renewed interest in the effect of FDI on the economic performance of both the host and the home country and in the appropriate government policy toward FDI. Not surprisingly, a critical consideration in this discussion is the responsiveness of FDI to taxation of the income that it generates. If FDI is not responsive to taxation, then it may be an appropriate target for taxation by the host country, which can raise revenue without sacrificing the economic benefits of FDI. If, however, the volume of FDI declines with taxation, the host country must consider the trade-off between the possible revenue gains from increased taxation and the economic costs of discouraging FDI. This issue is very important for countries in which the degree of FDI penetration is large and the revenue raised from taxing FDI represents a significant fraction of total tax revenue. For example, in Ecuador, Egypt, Indonesia, Nigeria, Peru, and Trinidad and Tobago tax payments by U.S. corporations alone as a share of host country corporate tax revenues exceed 10 percent (Alworth 1988, p. 33).

Because of the ready availability of data on investment to and from the United States, most of the recent empirical literature on the tax sensitivity of FDI has focused on U.S. inward FDI. In this article we extend the standard methodology used in these studies to examine the effect of taxation on FDI in Mexico. The recent empirical literature on FDI in the U.S. is reviewed. The salient features of

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Finally, as stressed by Newlon, the interpretation of the coefficient on the rate of return to FDI is problematic. This rate of return is defined as the after-tax income from direct investment divided by the stock of direct investment. When the home country has a foreign tax credit with deferral, it is often optimal for the subsidiary to finance investment by first using retained earnings and, only when these earnings are exhausted, using funds transferred from the parent firm. This hierarchy of financing implies that whenever a subsidiary's investment exceeds its retained earnings, its retained earnings will exactly equal its income. In these cases we would expect a direct association between the calculated rate of return on FDI (in which after-tax income is the numerator) and retained earnings, regardless of whether the average rate of return in fact influences decisions concerning new FDI. As Newlon notes, if subsidiaries were following a fixed dividend payout rule (for example, paying out a fixed fraction of income), a direct association between income and retained earnings would also be observed.

II. Foreign Direct Investment in Mexico

Historically, because Mexicans have viewed foreign investment as a vehicle for political and economic domination of Mexico, the thrust of government policy through the National Foreign Investment Commission has been to regulate rather than to promote foreign investment. From 1948 to 1982 policy toward foreign investment became increasingly restrictive. First, important industries such as telecommunications, electric power, timber, and film distribution were nationalized. Second, foreign investment in most industries was restricted to minority participation subject to prior authorization from the central government. The regulatory environment discouraged foreign participation, resulting in an annual average net FDI flow of less than 1 percent of gross domestic product (GDP) from 1950 to 1985. These policies have been dramatically reversed in recent years, beginning in 1986 with the initiation of a debt-to-equity conversion scheme and the exemption of small to medium levels of investment from government approval for foreign majority participation. Beginning in 1987 majority FDI participation in specified sectors was permitted on a case-by-case basis. On May 19, 1989, President Carlos Salinas de Gortari announced a major shift in Mexican policy toward foreign investment, stating:

> We are a mature country with the judicial, intellectual, and economic capacity to assimilate the largest flow of foreign investment. On behalf of all Mexicans, we will institute new regulations to encourage the types of foreign investment that support our economic policy objectives without compromising our sovereignty and freedom of action.

Major changes in the foreign investment regulations soon followed. Under the new regulations, majority investment in nonrestricted sectors meeting all of the following six criteria is eligible to receive automatic approval:

1. The investment is less than Mex$250 billion (in 1989 pesos) (about US$100 million)
2. The capital originates from outside Mexico
3. The project is located outside the country's three major industrial cities (Mexico City, Monterey, and Guadalajara)
4. The foreign exchange cost is spread evenly over three years
5. The investment provides permanent jobs and training
6. The project uses technologies satisfying existing environmental regulations.

Furthermore limited access to the Mexican stock market is permitted through special trust funds. Temporary access to some sectors normally reserved for Mexican citizens is allowed under 20–year trusts for investment in Mexican companies with high export potential or in financial distress. Thirty-year trust funds provide access to otherwise restricted geographical zones, such as coastal and border areas. New regulations stipulate automatic approval of an application on which the National Foreign Investment Commission fails to reach a decision within 45 days of the initial submission.

It is clear that whatever the demand for FDI in Mexico has been in the postwar period, the supply of available opportunities for FDI has been severely limited until recently. Thus it will be important to control for this in the analysis. If demand was always limited by these regulations in a binding way, there would be no interesting story to tell about taxation. Data on FDI flows indicate a positive correlation between the flows and after-tax rates of return in FDI and therefore suggest that these limitations were not always binding, so that tax influences on demand did play a role in the volume of FDI into Mexico.

The instability of the Mexican economy also poses analytical problems. High inflation rates (114 percent in 1987) and nominal interest rates (92 percent in 1987) have dramatic consequences for the calculations of effective tax rates on new investment. The standard assumption used in such calculations—that current values for inflation, interest rates, tax rates, and tax depreciation rates will persist in the future—are unlikely to be accurate, but reasonable alternative assumptions about expectations are not obvious. This problem suggests that some measure of the average rate of taxation (taxes paid divided by a measure of economic income) may be a more accurate measure of the tax system's disincentives than an analytically constructed marginal tax rate.

Mexico taxes nonresidents under the territorial rule so that only income originating from Mexican sources is taxed. Mexico is a member of the Latin America Integration Association, which is designed to provide preferential treatment to member countries in matters of trade and taxation. Mexico has not yet concluded any comprehensive treaty on avoiding double taxation or tax sparing with any other country.

One important change in the tax code concerned the treatment of income of subsidiaries and branches of foreign companies. Until 1989 establishing a subsidiary rather than a branch office in Mexico was a tax-preferred alternative,

since the retained earnings of a subsidiary of a foreign corporation were exempt from taxation, with dividends taxed upon distribution to a parent. All income of a branch office, however, was taxed upon accrual. Following changes in the Mexican tax code in 1989, the different treatment of subsidiary and branch income was eliminated. The major features of the taxation of income earned in Mexico by foreigners, as revised in 1989, are summarized in appendix A.

III. Some Theory and the Empirical Model

The modern theoretical literature has, for the most part, concluded that the demand for FDI is primarily an issue of industrial organization. Dunning (1985, pp. 6–7) argued that foreign investment by firms is more likely if the firms possess ownership-specific advantages relative to host country firms in sourcing markets, find it profitable to use these advantages themselves rather than to lease them to host country firms, and find it profitable to utilize their ownership-specific advantages in the host country rather than at home. A large body of empirical literature (see Dunning 1985) has tested this theory of international production, usually referred to as the "eclectic" theory. Much of this research has been cross-sectional, relating the extent of foreign investment in a given sector to characteristics of the sector that represent ownership-specific and location-specific advantages. Studies of the effects of taxation on FDI have generally taken the view that firms must weigh the benefits of foreign investment against the tax consequences of carrying out FDI. We hypothesize that the tax systems of both Mexico and the firm's home country affect not only the incentives to invest but also the best way to finance a given level of FDI.

Mexico asserts the right to tax income originating within its borders, including income generated by multinationals. The effective tax rate on this income depends in a complicated way on the statutory tax rate on corporate income, on the extent of tax credits granted, and on the definition of the tax base, including the system of depreciation and the way in which gross income and deductions are allocated between Mexican source and foreign source. There are two approaches to measuring the effective tax rate on new investment. In the analytical approach pioneered by Hall and Jorgenson (1967), the level of pre-tax return required for a stylized investment to yield a given after-tax return is calculated. The wedge between the pre-tax and the after-tax rates of return is a measure of the tax-related disincentive to invest. This procedure requires details on the tax code, rate of inflation, economic depreciation rates, and the proportion and costs of debt and equity finance. Thus the effective tax rate on FDI from equity transfers and retained earnings would be different.

The alternative approach is to calculate the ratio of taxes paid in a given year to a measure of income that is independent of the definition of taxable income. This approach may capture some of the features of the tax law that are left out of the analytical approach and also may more accurately capture some features that are present in the analytical models but are inadequately represented by the

stylized assumptions that must be made to calculate marginal effective tax rates. As argued above, because of the extreme volatility of the Mexican inflation rate, such an average tax rate may be more appropriate.

The multinational's country of residence may also tax the income that is generated in Mexico. This is not, however, true of all countries, some of which, notably France and the Netherlands, operate a territorial system for active (in other words, nonportfolio) income earned abroad. Under a territorial system the home country levies no tax of its own on the foreign source income. Under the worldwide system of taxation, used by the United States, Canada, United Kingdom, and Japan among other countries, the home country asserts the right to tax the multinational's income regardless of where it is generated. In order to avoid two tiers of taxation, these countries offer their multinationals a limited credit against domestic tax liability for certain taxes paid to foreign governments. The credit is generally limited to the tax liability that the foreign source income would incur if home country tax rules were applied. Finally, in most cases the tax liability (and credit) on subsidiaries' foreign source income is deferred until dividends are repatriated to the parent company, but the foreign source income of branch operations is taxable upon accrual.

Let τ_m be the effective rate of tax on new investment imposed by the Mexican tax system. For a multinational from a country using the territorial system, τ_m is also the total tax burden imposed. For a multinational from a country with a worldwide system of taxation, the home country's taxation must also be considered. The old view of this extra level of taxation is given by max $[\alpha(t_u - \tau_m), 0]$, where t_u is the tax rate of the home country and α is a value between zero and one that reflects the benefits of being able to defer the tax liability on subsidiaries' foreign source income until the earnings are repatriated. Note that t_u is generally closer to a statutory rate than an effective tax rate on investment, since the home country tax base for foreign source income generally does not allow such things as accelerated depreciation and investment tax credits that affect taxable income from domestic operations. In cases in which earnings are never repatriated (α is equal to zero) or when the firm is in an excess credit position ($\tau_m > t_u$), so that taxes paid to the host country generate foreign tax credits that may be used to completely offset the tax that would otherwise be due upon repatriation, the home country tax is irrelevant. An opposite extreme case occurs when α is equal to one, implying that the tax liability of the multinational in the host country can be fully offset by tax credits in the home country.

The new view of the total tax burden on FDI, expounded by Hartman (1984, 1985), distinguishes between debt and equity financing. If investment is financed by the retained earnings of the foreign subsidiary, then the tax rate in the home country is irrelevant, so that the total tax burden is τ_m, and any taxes due upon repatriation to the home country are irrelevant to the investment decision. The tax rate in the home country would be relevant for multinationals that are contemplating a transfer of funds to a foreign subsidiary, so that the total tax burden on FDI in this case is $\tau_m + \alpha(t_u - \tau_m)$.

Scholes and Wolfson (1989) have suggested that the ownership of a given stock of domestic capital will depend on the relative tax rate paid by alternative owners. This implies that, in the contest for ownership of Mexican capital, foreign owners are more likely to be successful the lower the ratio $[\tau_m + \alpha(t_u - \tau_m)]/\tau_m$. (This of course applies only if the home country operates a worldwide system of taxation.) The surprising implication of this analysis is that, as long as α is greater than zero and t_u exceeds τ_m, an increase in τ_m, the tax rate in Mexico, will increase foreign ownership of Mexican capital, because, although an increase in τ_m is fully borne by potential Mexican owners, its effect on foreign owners is partly offset by foreign tax credits. Thus the relative tax burden on *foreign owners from countries with worldwide tax systems is reduced.* Of course, to the extent that τ_m reduces the incentive to undertake investment in Mexico, both domestically and foreign-owned investment will decline. The overall impact on FDI thus depends on the relative strength of the Scholes-Wolfson ownership effect and the volume effect. Furthermore the ownership effect applies only to investment from countries with a worldwide tax system and only to the extent that tax rates in the home country exceed those in Mexico, so that additional taxes paid to the Mexican government do in fact generate additional foreign tax credits.

The foregoing discussion suggests that a general empirical model of the impact of taxation on FDI in Mexico has the following form:

$$\text{FDI}_s = f_s\,[\tau_m; L(t_u - \tau_m), X] \tag{1}$$

where X is a vector of nontax factors that affect FDI, the subscript s refers to the source of investment financing, and L is an (inverse) index of the credit status of the excess investing countries. The presumption is that the greater the extent of excess credit status, the smaller the effect of the home country's tax rate. For empirical estimation equation 1 is specified as follows:

$$\text{FDI}_T = a_o + a_1\tau_m + a_2\,(t_u - \tau_m) + a_3 \cdot L \cdot (t_u - \tau_m) + a_4X + u_T \tag{2a}$$

$$\text{FDI}_R = b_o + b_1\tau_m + b_2\,(t_u - \tau_m) + b_3 \cdot L \cdot (t_u - \tau_m) + b_4X + u_R \tag{2b}$$

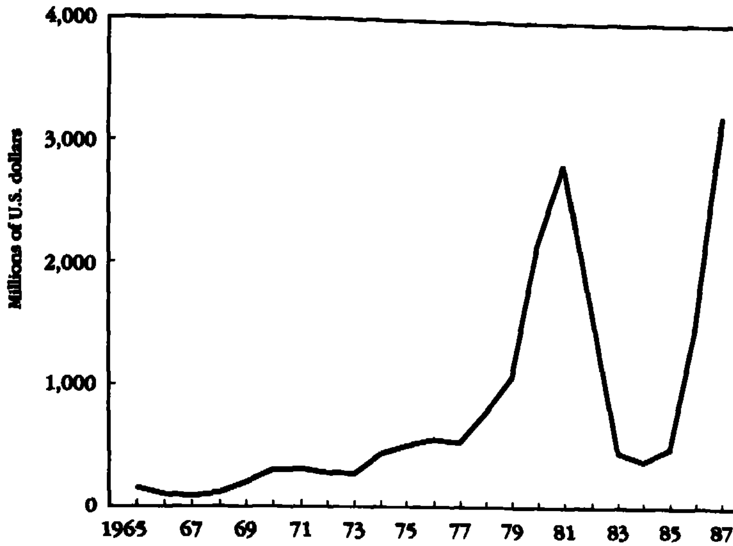
where the subscript T denotes FDI financed by transfers of funds, and the subscript R denotes FDI financed by retained earnings.

IV. The Data and Estimation

Aggregate data on stocks and flows of FDI and other relevant variables for 1965–85 have been assembled from a variety of sources. A few key variables utilized in the study are described here, and details of variable construction are given in appendix B.

Data on FDI levels come primarily from the Banco de Mexico, which provides substantial details on the financial flows of firms with foreign capital, including the amount of transfers and reinvested earnings and a breakdown of FDI by

Figure 1. ***Foreign Direct Investment in Mexico, 1965–87***

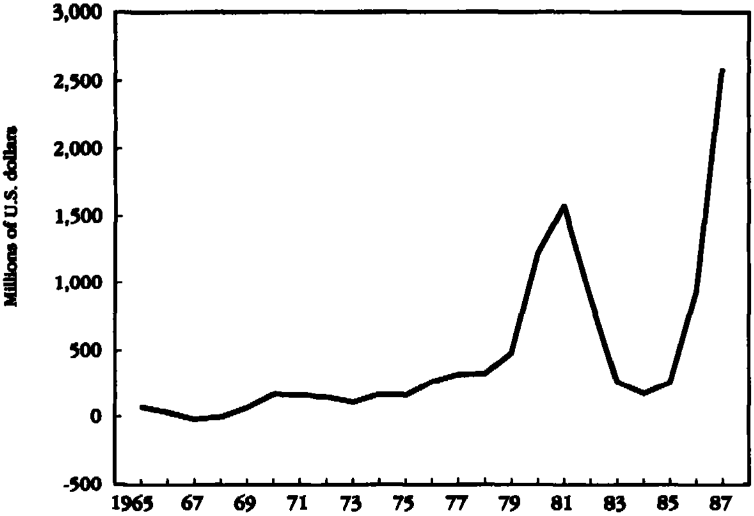


Source: Banco de Mexico (various issues)

economic sector and the country of origin. Figure 1 shows FDI from 1965 to 1987. From 1965 to 1977 FDI slowly but steadily increased. The beginning of the oil boom in the late 1970s led to dramatic increases in FDI, which peaked in 1981 at US$2.8 billion. The end of the oil boom in 1982 coincided with a sharp drop in FDI. FDI accelerated again in 1986, when debt-equity conversion schemes were initiated and small to medium-size FDI was exempted from the government control and approval process. Figures 2 and 3 show details of FDI financed by transfers and retained earnings, respectively, during 1965 to 1987. Both types of FDI follow the same broad trends, but transfers become the dominant source of financing in the mid- to late 1980s.

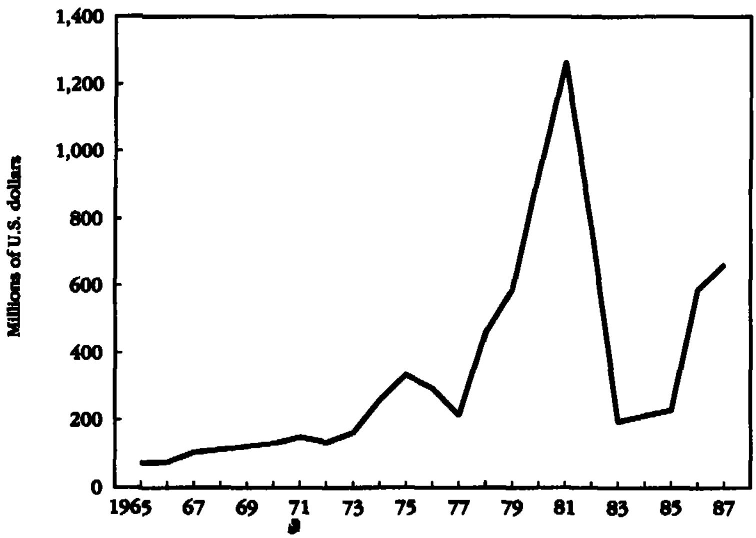
Several tax concepts are computed as measures of tax disincentives, beginning with the simple Mexican (t_m) and U.S. (t_u) statutory tax rates. Four alternate measures of the tax disincentive to new investment in Mexico—three marginal and one average measure—are also developed (see appendix B for details). A historical series on the marginal effective tax rate on new aggregate investment in Mexico (τ_m) is computed using the standard Auerbach-Hall-Jorgenson methodology, and a comparable series for the United States is obtained from Auerbach and Hines (1988). Then marginal effective tax rates for transfers and for retained earnings are calculated. The marginal effective tax rate measures are conceptually attractive, but, as discussed above, a highly inflationary environment with financing constraints diminishes their usefulness. Therefore, an aver-

Figure 2. *Foreign Direct Investment in Mexico Financed by Transfer of Funds from Parent Company, 1965-87*



Source: Banco de Mexico (various issues).

Figure 3. *Foreign Direct Investment in Mexico Financed by Retained Earnings of Multinationals, 1965-87*



Source: Banco de Mexico (various issues).

age effective tax rate measure based on corporate tax liability per dollar of value added is calculated for Mexico (T_m) and the United States (T_u). The choice of this particular formulation of the average effective tax rate is based primarily on the completeness of the data series for this measure.

The index of the excess foreign tax credit position of investing multinationals (L) is calculated as the ratio of aggregate foreign tax credit claimed to foreign tax credits available to U.S. multinationals investing in Mexico. Because U.S. investment has accounted for about two-thirds of Mexican FDI in the period studied, it is a reasonable indicator of the excess credit status of investing countries generally. The closer this index is to zero, the more likely it is that the typical U.S. multinational is in an excess credit position. At the extreme where this index is equal to one, all available foreign tax credits are immediately claimed, implying that the multinationals are in an excess limit (deficit of credit) position. A major limitation of this measure is that data are available for only five years; values for the remaining years are interpolated. Longer time series data are available on an alternate, but conceptually less satisfactory, measure: the credit status of all U.S. multinationals, whether investing in Mexico or not. Because there are some firms with no Mexican investment in this sample, use of this latter measure in the analyses of reinvested earnings would be subject to caveats.

A useful measure of country risk factors can be derived from the annual country credit ratings published by the Business International Corporation and the *Institutional Investor*. These credit ratings are based on a composite index of political, commercial, and monetary factors. In order to obtain this index for the entire sample period for Mexico, the Business International Corporation index for 1965 to 1979 is spliced with the *Institutional Investor* index for 1979 to 1987.

Black market exchange rate premia are used as an index of regulation in Mexico. Exchange rate premia in Mexico correlate well with the past history of regulation and, therefore, serve as a reasonable proxy of the regulatory environment. This is, however, not a fully satisfactory measure of regulations, because it may simply be capturing the effects of import restrictions. To capture the effects of protective trade barriers on inward investment, effective tariff rates are calculated using data on import duties and the value of imports from various Mexican government publications.

A wide array of variables is available to implement the empirical models specified in equations 2a and 2b. The modeler must choose among several alternate measures of tax disincentives, two alternate measures of multinationals' excess credit status, and a host of nontax factors, including quantitative restrictions, unemployment rates in the host and home countries, and exchange rate and price movements.

The biggest dilemma in model estimation is presented by the choices available for the tax rate variable. Economic theory does not provide much guidance in this respect beyond a preference toward marginal tax rates, so final variables are

selected primarily on the basis of model selection tests. Mexican data show a great deal of variability during 1977 to 1987 because of oil booms and busts. An intercept dummy variable with a value of one for the oil boom-bust period and zero otherwise is used in various regressions, but it is found to be insignificant and is, therefore, dropped from further analysis. The economic environment associated with oil boom and bust cycles is well captured by credit ratings, and therefore it is possible to isolate tax effects from the effects associated with a general deterioration or amelioration of economic activity. Furthermore the marginal effective tax rate incorporates the rate of return to FDI and therefore captures the variability of profits over time.

As a first step in model specification the Lagrange multiplier test is used to screen regressors. Subsequently, several alternate models are formulated, and standard model selection tests were conducted to pick the "best" model. These tests take the general form of the residual sum of squares multiplied by a penalty factor. The penalty factor varies directly with the number of estimated parameters, so that an increase in model complexity would reduce the residual sum of squares but raise the penalty. Two of the better regressions based on these tests are presented in table 1. Only regressions incorporating the aggregate marginal effective tax rate are presented here, because this formulation allows us to test the two alternative views on tax sensitivity of FDI in a simple and transparent manner. Results from regressions incorporating the marginal effective tax rate on transfers and retained earnings are close to this simple formulation.

FDI from transfers are very sensitive to the Mexican marginal effective tax rate. The estimated coefficient on τ_m implies a startlingly high elasticity of −6.25 of FDI transfers with respect to the marginal effective tax rate when evaluated at the mean values over the period; a more reasonable elasticity of −0.79 is obtained when evaluated at 1987 values. Since the elasticity of marginal effective tax rates with respect to the Mexican statutory tax rate is only −0.2, the elasticity of FDI transfers with respect to changes in Mexican statutory tax rates is −1.24 at mean values and −0.16 at 1987 values. The large difference in elasticities calculated at mean and 1987 values results from the increased magnitude of FDI in Mexico in recent years; what would have been a very large change in FDI in previous years represents a much smaller change in relative magnitude in recent years. This same fact implies that the behavior of FDI in recent years is critical to the estimation results. For example, if the equation for FDI transfers is estimated excluding the years 1985 through 1987, the large negative coefficient on τ_m disappears. This suggests that future research should focus on whether the recent surge in FDI transfers and decline in τ_m are in fact causally related or coincidental.

The tax differential variable $t_u - \tau_m$ and the composite variable on the credit status of multinationals $L(t_u - \tau_m)$ have signs consistent with expectations but are not statistically significant. However, the coefficients imply that for the extreme excess limit case ($L = 1$), it is approximately true that the t_u, but not τ_m, provides a disincentive to investment; in general, though, the tax rates in both

Table 1. *Estimated Foreign Direct Investment Equations for Mexico, 1965–87*

Independent variable	*Dependent variable*: FDI *financed by transfers*	FDI *financed by retained earnings*
Marginal effective tax rate in Mexico (τ_m)	− 6,766.7 (−2.4)	− 2,593.7 (−2.9)
U.S. statutory tax rate minus Mexican tax rate ($t_u - \tau_m$)	− 3,994.5 (−0.8)	− 6,687.5 (−2.7)
Excess credit status of multinationals $L(t_u - \tau_m)$	− 3,012.1 (−0.6)	5,166.0 (2.5)
Country credit rating (CRM)	34.6 (3.8)	17.1 (3.0)
Index of regulations (REGU)	− 394.6 (−1.6)	− 340.0 (−1.9)
Effective tariff rate (MDM)	2,507.9 (1.1)	− 1,573.9 (−0.9)
Constant	2,341.1 (1.7)	3,415.6 (5.1)
Summary statistics		
$\bar{R}^2$	0.89	0.69
Log likelihood	− 157.7	− 146.9

Note: *t*-statistics are in parentheses.
Source: Estimation results based on equations 2a and 2b.

the home and host countries mattered. The empirical results weakly suggest that the regulatory environment in Mexico discourages foreign investment, while protective trade barriers have a positive effect on FDI.

The estimated equation for FDI from retained earnings indicates that such FDI is sensitive to the Mexican marginal effective tax rate, to differences in Mexican and U.S. taxes, to the credit position of the multinationals, and to Mexico's credit ratings and regulations. The elasticity of reinvested earnings with respect to τ_m is −1.5; the elasticity with respect to the Mexican statutory tax rate is −0.56 and with respect to the differences in Mexican and U.S. taxes is −2.8 (all calculated at 1987 values). A change in the credit status of multinationals toward excess credit positively influenced their decisions to reinvest rather than to repatriate their earnings, with an estimated elasticity of 1.9 at 1987 values. These results are qualitatively robust even if the 1985–87 data are eliminated.

In various formulations of the models the marginal effective tax rate variable shows a great deal of consistency as a determinant of transfers and retained earnings. Estimated coefficients of average tax rate and statutory tax rate variables, however, are very sensitive to model specification. This instability of coefficients is partly attributable to a degree of collinearity among a subset of variables. An unexplained aspect of this instability is that the coefficient estimates for regressions on retained earnings are less robust than those for transfers. Thus the conclusions reached in the following sections merely represent our

best judgments based on available imperfect data. It is conceivable that different conclusions could be reached if a better set of data was used.

Overall the results are consistent with the old view that the source of financing is not critical to the tax sensitivity of FDI and suggest that the tax regimes in both the host and home countries matter for FDI in Mexico. However, because of the difficulty in accurately measuring effective tax rates and the sensitivity of the results to alternative forms of the tax rate variables, these results concerning tax sensitivity must be interpreted with great caution. In addition to taxation, the regulatory framework and the overall economic and political climate in the country appear to influence FDI transfers and reinvestments in Mexico.

V. Policy Implications

Our analysis suggests that FDI in Mexico shows a great deal of sensitivity to the Mexican tax regime. If this conclusion stands up in further investigations, it implies that Mexico must aim for tax rates closer to—but neither higher nor lower than—the U.S. rates. Higher rates would discourage investment, while lower rates would allow a transfer of revenue from Mexico to the U.S. Treasury through the operation of U.S. foreign tax credit provisions. However, the U.S. Tax Reform Act of 1986 has pushed more U.S. multinationals into excess credit status, thus increasing the likely disincentive effects of Mexican taxation of FDI and reducing the possibility that reductions in Mexican tax rates will simply transfer revenues to the United States. This implies that, for U.S. multinationals that operate globally, a tax rate below that of the United States may be appropriate (Slemrod forthcoming).

Mexico has already implemented tax reforms making the tax regime competitive with the United States and Canada. Furthermore effective taxes on reinvestments in Mexico are lower than that on repatriations, which provides incentives for increasing retained earnings. However, the 2 percent assets tax begun in 1989 may, because of its partial noncreditability against U.S. tax liabilities, discourage a potential investor. This tax could be replaced by an alternative minimum tax with an adjusted base that would include tax preferences as part of taxable income. Such a tax could function the same way as the assets tax but would be fully creditable against U.S. tax liabilities. Because the tax changes introduced in 1989 do not contain any special disincentives for foreign investment, perhaps public policy attention in Mexico should focus on accelerating the process of deregulation of FDI that has already been initiated.

Appendix A. Taxation of Foreign Investment Income in Mexico

The corporate income tax base is now indexed. Taxable profits (defined as gross receipts minus costs, business expenses, dividends corresponding to previous periods of earnings, and net losses carried forward from other periods) are

subject to tax at a rate of 35 percent (the rate was 42 percent before 1987). Depreciation deductions are indexed or, alternatively, the present value of depreciation calculated at a discount rate of 7.5 percent may be deducted fully in all regions except major metropolitan areas and in all sectors except for the automobile industry. In major metropolitan areas only 60 percent of the present value of depreciation can be deducted in the first year, with the remaining 40 percent subjected to capital consumption allowances over time. An assets tax of 2 percent of the average value of total assets of business enterprises is levied but may be credited to income tax liability. Dividends may no longer be deducted by the corporation distributing them or included in the gross income of the recipient. The withholding tax on dividend distributions varies from 0 to 40 percent, depending on whether they are paid from accumulated earnings already taxed—the "net tax profit account"—or from previously untaxed other sources and the tax regime faced by the recipient.

Effective in 1991 the withholding tax rate on interest income paid to nonresidents is 35 percent, and on payments for technical assistance, transfer of technology, and fees (including royalties for patents when licensed in connection with the rendering of technical assistance) the withholding rate is 21 percent. Payments for the use of other royalties, such as for the licensing of trademarks or trade names, or patents without the rendering of technical assistance, are taxed at 40 percent. Goods in bonded warehouses are subject to a 3 percent tax either on the value on which import duties are assessed or on the declared value, whichever is greater. All businesses in Mexico are obliged to share 10 percent of their profits with employees. Employers are obliged to contribute 11 percent of workers' weekly wages to social security coverage, 1 percent of wages to children's nurseries, and 5 to 167 percent of wages to an occupational risk fund. In addition employers contribute 5 percent of wages to the National Housing Fund and 1 percent of wages to support education. The general 15 percent value added tax is applicable to all transactions concluded in the border and free zones.

Effective in 1991 immediate full expensing of the present value of capital consumption allowances calculated using a 7.5 percent discount rate will be available to all investors, in nonmetropolitan areas only, regardless of the resident status. Incentives in the form of investments and employment tax credit certificates for priority industries and special regions are available to Mexican residents only. The inbond assembly industries established in border areas may be completely owned and operated by foreigners, provided Mexicans are hired to process the imported raw materials using imported equipment and the processed goods are exported back to the country of origin. Table A-1 compares taxation of business income in Mexico and the major source countries for foreign investment (the United States and Canada). It shows that the Mexican tax system is fully competitive with the tax regime in the home countries of foreign investors. Mexico has also moved some distance toward adopting a full cash flow taxation in the future.

Table A-1. *Taxation of Business Income in Mexico, the United States, and Canada*

	Mexico (1991)	*United States (1990)*	*Canada (1990)*
Corporate income tax rate: general[a]	35 + 3.9 = 38.9	34 + 6 = 40	28 + 15 = 43
Withholding taxes: rates			
Interest	35	30	28
Dividends	0–40	30	25
Technology transfer fees	21	30	25
Royalties	40	30	25
Indexation of deductions	Full	No	No
Loss carry forward	5	15	7
Loss carry backward	0	3	3
Minimum/alternative minimum tax	2% assets tax	20% on taxable income inclusive of tax preferences	0.175% on capital in excess of $10 million creditable against 3% surtax on corporate profits
Capital gains taxation			
Coverage	Full	Full	2/3
Indexation	Full	No	No
Rate	35	34	28
Dividends deduction	No	Yes	Yes
Full expensing of investment	No	No	No
Investment tax credits	Regional and priority sectors	Energy investment, rehabilitation of real estate, targeted job credit	Regional and research and development

a. In Mexico the profit-sharing rate and, in the United States and Canada, the average provincial or state tax rates are added to the basic federal rate.

Source: Ugarte (1988); Price Waterhouse (1988, 1989); Mancera Hermanos (1989); International Bureau of Fiscal Documentation (1988); and Gil-Diaz (1989).

Appendix B. Data Definitions

Index of excess credit status (L). These data are obtained from the U.S. Commerce Department (various issues). The index is calculated as follows:

$$L = \frac{A}{B + C - D + E}$$

where

A = foreign tax credit claimed

B = foreign taxes paid or accrued

C = foreign taxes deemed paid

D = deductions for certain foreign taxes
E = taxes carried over.

Marginal effective tax rates. The following formulation developed by Auerbach (1990) is used in calculating marginal effective tax rates.

$$\tau = \frac{[(r + \delta)(1 - \Gamma)/(1 - t) - \delta] - s}{(r + \delta)(1 - \Gamma)/(1 - t) - \delta}$$

where

τ = effective corporate tax rate
r = weighted average cost of capital
δ = capital depreciation rate (assumed value)
Γ = present value of investment credits and depreciation deductions (based on a sample of 23 firms reported in Schwartzman [1987])
t = corporate tax rate (Mexico)
s = rate of return to supplier of funds (calculated based on data from IMF [various issues]).

Marginal effective tax rate for transfers (τ_t). This term utilizes the following expression for the weighted average cost of capital (r).

$$r = b\,\frac{[i_u(1 - t_u^p) - (\pi_u - \pi_m - \text{XRRC})]}{1 - t_{max}} + (1 - b)\left[\frac{\mu}{1 - \phi}\right]\left[1 - \frac{t_{min}}{1 - t_u}\right]$$

where

b = fraction financed by debt
μ = real discount rate for equity
t_u^p = U.S. personal tax rate
i_u = U.S. nominal interest rate
π_u = U.S. inflation rate
π_m = Mexican inflation rate
XRRC = rate of Mexican pesos depreciation against the dollar
t_{max} = higher of U.S. personal income tax rate and the Mexican withholding tax on interest payments
t_{min} = lower of Mexican and U.S. corporate tax rates
ϕ = effective tax rate on real equity return.

Retained earnings.

$r = \dfrac{\mu}{1 - \phi}$ is utilized in the effective tax rate formula.

Regulations (REGU). Exchange rate premia is used as a proxy for regulation. It is defined as:

$$\text{REGU} = \frac{\text{XRM} - \text{XRN}}{\text{XRN}}$$

where

XRM = market exchange rate
XRN = official exchange rate.

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Prospects for Agricultural Land Taxation in Developing Countries

Jonathan Skinner

Countries that collect tax revenue from the agricultural sector through export taxes, marketing boards, and overvalued domestic currencies are often loath to abandon these distorting policies because of the consequent revenue loss. One potential alternative is to replace these distortionary taxes with a land tax, which would not depress output prices or discourage foreign exchange earnings and which could be, in theory, a highly progressive tax. The advantages and disadvantages of a land tax are examined theoretically and using the specific experiences of Bangladesh, Argentina, and Uruguay. It is concluded that the land tax is not necessarily more efficient than other types of taxes; the Achilles Heel of land taxation is administration; progressive tax rates based on land holdings are nearly impossible to administer; land taxes have been ineffective at promoting nonrevenue goals; political support by farmers is necessary to implement the tax; and the most promising prospects for a moderate land tax system are in financing local, rather than central, government expenditures.

Many developing countries use a combination of export taxes, marketing boards, and overvalued domestic currencies to raise revenue from the agricultural sector. The effective rates of taxation on selected exports during 1980–84, for example, were 50 percent for wheat in Argentina, 34 percent for rice in Thailand, and 36 percent for cotton in Egypt (Krueger, Schiff, and Valdés 1988). Although these explicit and implicit taxes are highly inefficient, they do provide a substantial amount of government revenue. In 1977 the agricultural sector in Argentina accounted for just 15 percent of gross domestic product (GDP) but contributed 40 percent of total central government tax revenue (Trapido 1988). Despite the demonstrated benefits of reducing tax-induced distor-

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tions, most countries facing budgetary pressures are unwilling or unable to forgo the tax revenue.

One apparent solution to this problem is to replace currently used taxes with a tax on agricultural land. Such a tax causes no distortion of farm produce prices and can potentially raise significant revenue. In 18th century India the land tax accounted for more than two-thirds of all government revenue collected; in the first part of the 20th century it was still responsible for more than one-third of government revenue (Bird 1974, p. 35). Moreover progressive land taxes, in which rates rise with total land holdings, can theoretically ensure that wealthier farmers with extensive land holdings bear most of the tax burden. Given the prospect of raising revenue in an efficient and equitable way, shouldn't central governments be encouraged to adopt a land tax?

The presumed theoretical superiority of land taxation over other forms of taxation has been addressed in recent papers by Hoff (1991) and Skinner (1991). This article provides a broader perspective on the prospects for agricultural land taxation. Historical trends in the use of land taxes are examined, the theoretical literature on the efficiency of land taxes versus export and commodity taxes is reviewed, the effectiveness of the land tax in achieving nonrevenue objectives is considered, and recent experience with land taxation in Bangladesh, Argentina, and Uruguay is discussed. The article concludes with summary observations on the feasibility of, and conditions necessary for, replacing export, income, or commodity taxes with land taxes.

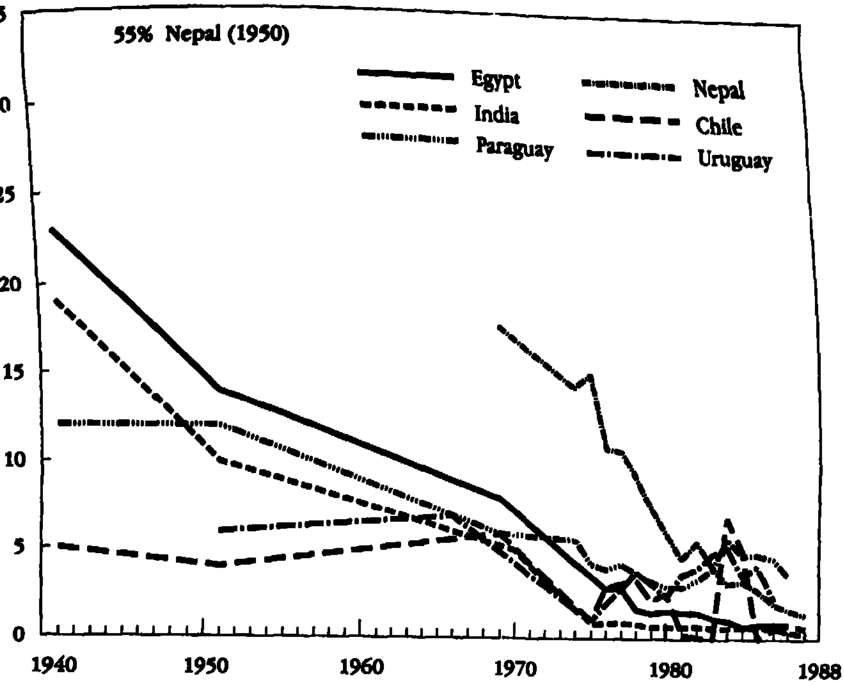
I. Historical Patterns of Land Tax Use

Agricultural land taxation has a long history matched only by the history of resentment on the part of taxpaying farmers. Most governments shifted to less contentious sources of revenue, such as indirect taxes on domestic and international trade, at the earliest opportunity (Bird 1974, ch. 6).

Figure 1 illustrates the declining importance of agricultural land taxation as a source of central government revenue for six countries between 1940 and 1988. The importance of land taxation decreased most sharply in Nepal, where the land tax accounted for 55 percent of central government revenue following World War II but less than 2 percent in 1988; the importance of land taxation also declined drastically in Egypt and India. The decline of the land tax in India during the 20th century continues a trend begun in the 19th century: land tax revenue as a fraction of total revenue fell from 69 percent in 1793/94, to 36 percent in 1891/92, to 16 percent in 1938/39 (Bird 1974, p. 133), and to less than 1 percent currently. Local land tax revenue for Indian states also receded from 13 percent of total state tax revenue in 1951/52 to only 2 percent in 1978/9 (Titus 1984, pp. 53–54).

Other countries have had similar experiences with land tax revenue. The agricultural land tax in Taiwan fell from 2.7 percent of central government revenue in 1975 to 0.3 percent in 1984 (Riew 1987). The land tax in Turkey was

Figure 1. *Land Tax Revenue as a Percentage of Total Tax Revenue in Six Countries, 1940–88*



Note: Land taxes are defined as property taxes less corporate property taxes on financial and capital transactions. This classification includes urban taxes.

Source: Pre-1970 data, Bird (1974) pp.34–35. Post-1970 data, IMF (1984, 1989).

hobbled by lagging tax assessments in the mid-20th century, so that although the market value of land increased 50-fold between 1936 and 1960, land tax revenue rose less than threefold (Bird 1974, p. 68). The property tax on agricultural land in Indonesia has recently benefited from improved assessment and collection methods, but the effective rate on land value is just 0.1 percent. Although Chile and Uruguay have enjoyed some success with a federally administered land tax, these countries are exceptions to the overall trend. Currently, it is rare for more than 3 or 4 percent of total government revenue to be raised through land taxes.

Part of the land tax decline depicted in Figure 1 could be due to factors other than an absolute decline in the use of land taxation. If the share of agricultural GDP is declining over time (as one might expect in a developing economy), then a fall in the share of land taxes to total taxes should be expected. But the ratio of land tax to total tax has fallen over time, even after adjusting for the decline in

the share of agricultural production.[1] The fact that land tax revenue is such a small fraction of total revenue implies that doubling or tripling land tax rates would have little impact on revenue. To boost land tax revenue to a significant fraction of total central government revenue would require a radical restructuring of current land tax systems.

II. Theoretical Aspects of Land Taxation

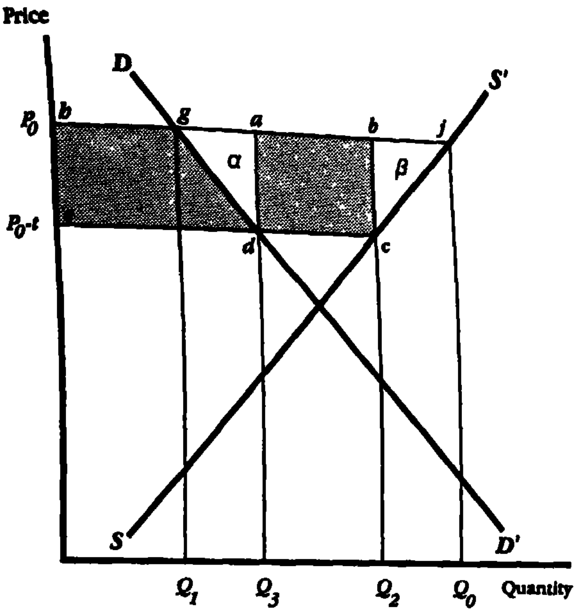
Nearly all taxes cause efficiency losses. Export taxes, for example, discourage domestic production, reduce foreign exchange earnings, and encourage domestic overconsumption of the taxed good. Income taxes may reduce labor supply, investment, and saving. The question of concern here is whether the land tax is necessarily more efficient than these alternative taxes.

Income taxes are not generally a viable option for taxing agriculture in developing countries because of unreliable farm records and home consumption of output. Tax authorities sometimes rely on presumptive income taxes based on an objective measure of farm productivity. Since land area and quality are the best indicators of farm productivity, the presumptive income tax becomes a de facto land tax (Bird 1974). Therefore in the theoretical section below the land tax is compared with an export tax. Export taxes (whether explicit or implicit) are most commonly used to raise revenue from the agricultural sector.

The effect of an export tax on domestic production and consumption of the agricultural good is shown in figure 2, in which the domestic demand curve, including both rural and urban consumers, is given by DD' and the domestic supply curve is given by SS'. Suppose that the country enjoys no monopoly power in world markets so that the world price of the commodity is fixed at P_0. Without the tax, producers receive P_0 and produce Q_0. The domestic quantity demanded is Q_1, so exports are $Q_0 - Q_1$. When a specific export tax is imposed, the world price remains at P_0, so that the price received by domestic producers declines by the full amount of the per unit tax, t. Domestic output falls to Q_2, domestic consumption rises to Q_3, and exports shrink to $Q_2 - Q_3$. The loss to producers from the export tax is the entire area $hjce$. Part of this loss, the shaded area $abcd$, is transferred to the government in the form of tax revenue and another part, the shaded area $hgde$, is transferred to domestic consumers in the form of lower prices and increased supplies available to the domestic market. By driving the domestic price below the world price, the tax also produces a deadweight loss equal to the area of the two triangles labeled α and β. The triangle β is the traditional production efficiency loss; the low net price to suppliers causes them to produce less than they would have without the tax. The

1. Adjusting the revenue share of land taxation by the ratio of GDP to agriculture value added corrects for the secular decline in the agricultural share of GDP. Because historical data are sparse, all of GDP was assumed to be from agriculture in earlier years. Even with this extreme assumption, the corrected ratio showed a strong decline in all countries except Chile, Paraguay, and Uruguay.

Figure 2. ***Economic Effects of an Export Tax***



triangle α is the consumption efficiency loss; consumers respond to the lower domestic price by overconsuming relative to the good's value on the world market.

In contrast, a land tax assessed on the site value of the land (the intrinsic economic value of the land excluding improvements) causes no distortions because the site value cannot be altered or reduced by the producer. The producers therefore behave just as they did without taxes: they receive P_0, produce Q_0, sell Q_1 domestically, and export $Q_0 - Q_1$. Some proponents of the land tax even claim that the tax will increase supply (shift the supply curve rightward) as landowners, burdened with cash tax payments, are forced to use their land more efficiently. Such a shift of the supply curve would increase output and spur exports further. The deadweight losses α and β are not incurred, making the land tax a more efficient source of tax revenue. Because of its nondistorting nature the land tax enjoys a distinguished theoretical pedigree dating back to Henry George and David Ricardo.

Replacing an export tax with a land tax would affect more than farmers' incentive to produce. Because export taxes depress domestic as well as export prices of agricultural commodities, they are a very efficient way to transfer income from the rural to the urban sector (Trapido 1988). Because the replacement of an export tax with a land tax will increase domestic prices, farmers

should prefer the land tax, whereas urban consumers should prefer the export tax.

Up to this point the analysis has assumed perfect certainty. When farm income is uncertain because of unforeseen yield or price fluctuations, the comparison between land taxation and export or commodity taxation changes. As Hoff (1991) has carefully shown, a fixed-rate land tax may be less desirable to farmers than an export tax because the land tax must be paid regardless of actual yields and prices. Land taxes thus increase the variance of net income. To the extent that governments have better access to credit markets than farmers, the export tax can serve a risk-pooling function (Newbery and Stiglitz 1981).

The empirical importance of risk pooling through export taxation in developing countries is not well established, but, even in a model incorporating uncertainty, land taxes may dominate export taxes. Numerical calculations suggest that the degree of output uncertainty must be high for even risk-averse farmers to prefer export taxes over land taxes (Skinner 1991). Deaton (1990) has argued persuasively that farmers are able to partially insure against bad harvests by precautionary saving so that the importance of risk pooling is reduced. In addition Hoff (1991) has shown that if risk-sharing institutions are imperfect, a combination of land taxation and commodity taxation dominates either tax in isolation. In Uruguay a land tax and a variable export tax are used in tandem, with appropriate adjustments in both taxes when world beef prices are low (Jarvis and del Rosario Medero 1988).

Orthodox economic theory showing that the land tax is more efficient than export or commodity taxes ignores administrative costs. A simple model developed by Skinner (1991) illustrates that administrative costs may be a relevant factor in choosing between land and export taxation. Under export taxation a farmer with more productive land will produce more output and pay more in taxes, all other things being equal, than a farmer with average quality land. Although export taxes may be avoided by smuggling goods past regulated shipping centers, harsh penalties for smuggling will induce a high degree of compliance even if the rate of detection is low.

Under a tax based on land quality, however, farmers have a strong incentive to misrepresent the productivity of their land. There is no "true" value of land, and reasonable people may differ over its inherent productivity or value, particularly when agricultural land markets are thin or when inflation is rampant. Assessing large penalties on taxpayers who incorrectly report low market land values could be viewed as confiscatory and patently unfair. To ensure equitable assessments, then, tax administrators must visit and evaluate individual plots of land. But such plot-by-plot surveying may lead to large numbers of appeals by landowners; Strasma and others (1987) suggest that just a 5 percent appeals rate can effectively shut down most land tax administration systems. Property assessment costs—*the social cost of transferring resources from the taxpayer to the* government—are an efficiency loss. Hence the land tax may be less efficient than the export tax once administrative costs are added in (Slemrod 1990).

If administering the land tax is so difficult, then why was it so important as a

source of revenue in the 19th century? One reason is that alternatives such as income or trade taxes were not then capable of raising large sums of money because of low levels of trade and manufacturing. Also there may have been less concern in the 19th century with horizontal and vertical equity in tax collection. Countries may no longer be willing to exert the force necessary to stifle the "strenuous resistance and even uprisings" (Yamamura 1986) by farmers reacting to heavy land taxes.

Up to this point it has been assumed that the land tax is a pure site value tax on the implicit value of the land excluding all improvements. But as all tax administrators learn, one must give up "the quest for the Holy Grail of the 'true' value of land; there is no such thing . . ." (Bird 1974, p. 238). In practice, tax authorities typically choose one of three methods to assess the tax: an *in rem* (property) tax based on land area, a tax based on the net income or market value of the land, or a tax based on objective measures, such as soil quality, distance from market, and other factors, which are proxies for presumptive income or productivity.

Tax based on land area. An *in rem* tax based solely on land area is the easiest to administer. There is no need to assess land quality, so the cadastral requirements are minimal and tax authorities need not establish detailed ownership records. If cadastral records are incomplete and rates are low, farmers often prefer to pay the land tax, since it may help to establish ownership or title. The disadvantage of the tax based on land area is that the tax burden as a fraction of land value is largest on the least productive land and is smallest on the most productive land. If poorer farmers own less productive land, then the *in rem* tax is regressive, whereas the export or commodity tax tends to be progressive to the extent that poorer farmers consume more of their own output. Furthermore the revenue potential of an *in rem* tax is limited by the maximum acceptable burden on the least productive land. Because of these problems the *in rem* tax must remain a limited way to raise central government revenue.

Tax based on the net income or market value of land. A tax on the land's market value or net income includes improvements as well as the site value of the land, thereby partially shifting the tax to owners of capital and distorting incentives to improve the land.[2] Efficiency considerations are ignored here, and the focus instead is on the administrative difficulties of determining market value. One approach is to allow self-assessment of land value, but without penalties for underassessment such a method rarely yields much revenue. As one official commented concerning the self-assessment program in Colombia:

> . . . property owners' statements were—and are—highly undependable. Their memories are notoriously bad, both as to what they own and how much of it they own. And their modesty with respect to the value—for tax

2. For a debate on the neutrality of site value taxation, see Bentick (1979), Mills (1981), Tideman (1982), and Turnball (1987). For a good theoretical discussion of land taxation and shifting, see Bruekner (1986).

purposes—of their own property is simply incredible. (Morgan 1967 quoted in Bird 1974, p. 84.)

The problem with self-assessment is that there is often little or no penalty for "modesty." Accurate self-assessment may be encouraged by allowing the government or private individuals to bid on the disputed land; the taxpayer may then either sell the land for the bid price or pay the tax on the bid price (Strasma and others 1987). In equilibrium, all taxpayers will truthfully report the market value of their land. The disadvantage of such a technique is the potential for abuse or extortion (Bird 1974). For example, larger farmers can either buy out smaller farmers or force them to pay higher land taxes if they refuse to sell their land. Even if these bids are not actually carried out, they can be used as threats.

The other way to enforce market value taxation is to assess each plot of land using a cadastral survey and then to reassess the land periodically. This approach entails the substantial costs—before any revenue is collected—of conducting cadastral surveys; in Brazil the average cost per parcel was $220, or about $7 per hectare (Strasma and others 1987). It is estimated that the survey costs of a five-year cadastral revision cycle in Bangladesh would exceed the additional revenue collected (Skinner 1987). This method is also particularly vulnerable to inflation. In late 1986 the assessment on one plot of land in Bangladesh was fixed at its 1922 nominal rate! In theory it should be straightforward to index the tax rate to avoid the problem entirely, but in practice few tax authorities use indexing for land taxation. In part inflation may reflect real price shocks such as oil price increases. But politicians may also be loath to increase nominal tax rates and may choose to rely instead on ad valorem trade, income, and property transfer taxes that are buoyant with respect to inflation.

Tax based on objective measures. A land tax assessment that relies on objective features of the land, such as distance from the market, soil quality, and irrigation facilities, provides a crude measure of the income potential of the land. It is not a pure site value tax, because capital improvements such as irrigation increase tax assessments. In many respects this type of tax holds the greatest promise for future tax revenue. There is no need to rely on market assessments, and the tax can be adjusted for inflation by increasing the tax rate on the (constant) quality index of the land. Furthermore this type of tax can distinguish between as many or as few types of land as can be handled by tax administrators. For example, one could assess land tax based only on distance from the market or on objective measures of soil quality. For developing countries the administrative prospects for such objective grading of land are brighter than market-based approaches.

III. Nonrevenue Objectives of Land Taxation

Land taxation has often been viewed as a way to encourage a number of nonrevenue development objectives. One such nonrevenue objective is encouraging productive efficiency. That is, given output and input prices, it is thought

that the land tax would encourage farmers to seek the most productive use of their land, perhaps even prodding large absentee landlords to sell "unproductive" land to small farmers. It is not clear at a theoretical level why a land tax should encourage more productive use of land, unless it is tied to a reduction in export taxation (which would increase domestic output prices). By definition an efficient tax should not affect land use decisions. However, it is possible that a sufficiently large land tax could spur landowners to work harder (an income effect) or to break away from reliance on traditional methods of production and seek new and more efficient methods (Leibenstein 1978).

The Meiji period in Japan has been cited as one illustration of how land taxation has improved agricultural productivity. Several researchers have suggested that after the imposition of a 25 percent tax on gross income during the latter part of the 19th century, farmers increased agricultural investments and sought to market their produce (Yamamura 1986). That is, the necessity of making cash payments to the government motivated farmers to work harder and more efficiently. One potential shortcoming of this explanatory link between land taxes and productivity is that other factors, such as improved regional markets and land reform, could have provided the incentive for improved agricultural investment. Furthermore the income effect of land taxation can cut both ways. Lindauer and Singh (1979) suggested that the heavy Indian land tax at the turn of the century may have reduced farmers' productivity and nutrition by cutting into consumption or may have forced peasants to borrow money during bad harvests. Subsequent defaults by small farmers increased the landless population and concentrated holdings among large landowners. In this case the income effects of land taxation discouraged productivity goals.

Land taxes are also sometimes believed to encourage efficient land use by discouraging speculation in idle land. Again the theory behind this belief is weak. Imposition of the tax reduces the market price of land, but, once speculators have suffered this one-time loss, their future expected profits from holding land are unchanged. To see this, suppose that the land tax reduces land prices by 20 percent and that land today is held in expectation that land prices will be higher next year. Because the tax reduces both the current and future land price by 20 percent, the rate of change in land prices is independent of whether the land tax is imposed or not (also see Tideman 1990). Land taxation would only effectively discourage speculation if it burst a speculative "bubble" in land prices.

A third nonrevenue objective of land taxation is to encourage land reform. Taxing large farm holdings at progressive rates could force their breakup into several smaller farms. Efforts to encourage land reform through this channel in Colombia and other countries have generally been unsuccessful for two reasons. First, commonly administered land tax rates have been neither large enough nor progressive enough to affect land use. In one study of Colombia, L. Harlan Davis concluded that:

> Because of low rates, the tax burden is a relatively small percentage of income and this fact . . . means that there is little opportunity for the

nonfiscal effects to operate . . . particularly . . . among the larger farmers, where the tax burden is lightest (Strasma and others 1987, p. 41).

Second, land taxation is politically unpopular because neither large nor small farmers like increased tax rates. At least the benefits of direct land reform are obvious to landless peasants (Bird 1974, pp. 262–67, and Strasma and others 1987).

More recently, land taxation has been proposed to promote the environmentally sound use of land. For example, land taxes could be assessed on environmentally harmful conversions of Amazon rain forests to cattle ranches, which would resemble a Pigouvian tax on the external effects of environmental degradation. Binswanger (1989) presents evidence that the existing land tax in Brazil actually encourages the destruction of the Brazilian rain forest because forest land is considered to be "unused" and as a consequence is subject to a higher tax rate. Even if the design of the land tax were to discourage deforestation in Brazil, the incentive is likely to be minimal given existing tax rates. Binswanger reports that for land plots above a minimum size, the statutory land tax rate in Brazil is 3.5 percent of the unimproved value of the land, with a reduction of up to 90 percent in tax liability, depending on land use. A more important factor in encouraging deforestation is the exemption of most agricultural profits from corporate and individual taxes in Brazil.

A land tax may still be able to affect environmental quality indirectly, by tying tax proceeds to a particular expenditure program. This "valorization" or earmarking of taxes may provide the most effective means for local self-financing of projects that combat deforestation, pollution, and erosion of waterways.

IV. Case Studies: Bangladesh, Argentina, and Uruguay

The experience of Bangladesh, Argentina, and Uruguay illustrates some of the advantages and disadvantages of the land tax described above.

Agricultural Taxation in Bangladesh

This section draws on Skinner (1987), Alm and Schroeder (1985), and World Bank data. In 1959–60 direct agricultural land taxes in Bangladesh (then East Pakistan) comprised 66.2 percent of all direct taxes and 19.8 percent of total central government tax revenue. Following independence small landowners with less than 8.25 acres were exempted from land taxes, but, because of the resulting fall in tax revenues, the government implemented the Land Development Tax (LDT) in 1976. The LDT consisted of a flat rate on commercial and residential areas, with a two-tier system for agricultural land: Tk3 ($0.09 in 1989 US dollars) per acre for holdings under 8.25 acres and a marginal rate of Tk15 ($0.45) per acre for holdings above 8.25 acres, with a minimum tax payment of Tk1 per land owner.

The commercial and residential rates were increased in 1980 and 1982, and in 1982 the agricultural rates were made sharply progressive, with nominal rates

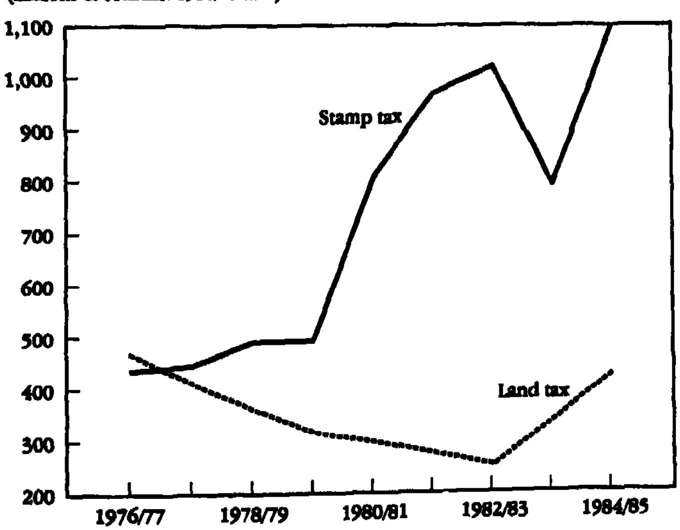
ranging from Tk3 per acre to a marginal rate of Tk145 ($4.35) per acre for land holdings larger than 25 acres. Following the 1982 adjustments, the industrial and commercial rates imposed on land near police stations (located in the cities of Dhaka, Khulna, and Chittagong) were 69 times higher than the maximum rate on agricultural land.

Total real revenue collected between 1976/77 and 1984/85, in 1984/85 prices, is shown in figure 3. Despite the substantial rate increases during the 1980s, inflation eroded the value of revenue collected, and only in 1985/86 did real tax collections regain the levels collected during 1976/77. LDT revenue also diminished relative to the aggregate tax revenue of the central government, and by 1987 the LDT accounted for only 0.2 percent of agricultural value added. Although some countries have simply replaced land taxes with indirect methods of raising revenue, such as overvalued domestic currencies and marketing boards, the Bangladesh government during the mid-1980s did not place such implicit taxes on the agricultural sector (Hossain, Rahman, and Akash 1985; World Bank data).

The difficulty of maintaining revenue from a nonindexed *in rem* land tax in the face of inflation contrasts with the ease of revenue collection for the Bangladesh nonjudicial stamp tax. In 1986 the stamp tax was assessed on property transfers at a progressive rate between 6 and 18 percent of the declared value of the property. As shown in figure 3, in 1976/77 revenue collection from the two

Figure 3. ***Revenue from Land and Stamp Taxes in Bangladesh, 1976/77-1984/85***

(millions of constant 1984/85 taka)



Source: World Bank data.

taxes were nearly identical, but by 1986 the stamp tax collected more than twice as much revenue. Property transfer taxes may be inefficient because they discourage the sale of property, but they are relatively easy to administer, and, because nominal property values rise with inflation, stamp tax revenue has been resilient to inflation in Bangladesh.

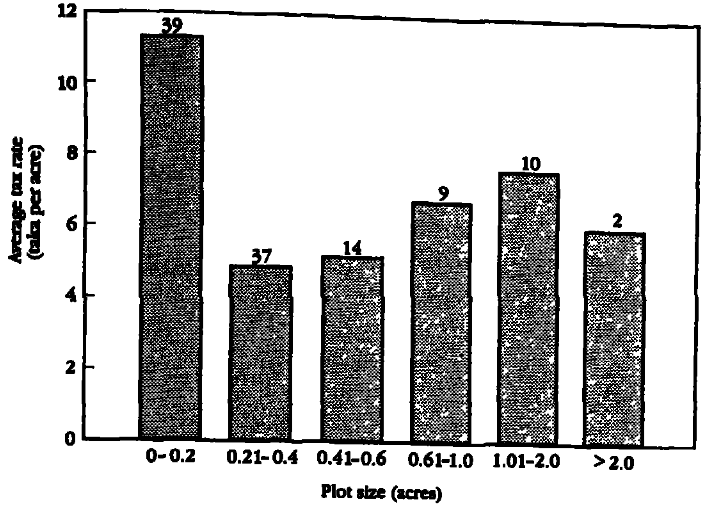
The 1982 revisions of the LDT made the tax substantially more progressive, with the ratio of the highest to the lowest marginal rate increasing from 5 (15:3) to nearly 50 (145:3). Given the substantial concentration of wealth in land holdings (Rahman 1982), the assessment on the wealthiest 1 percent of the population was calculated to be 55 percent of the total (projected) tax revenue of Tk453 million, or $13.6 million (World Bank data). This combined with the actual tax collections in 1985/86 of Tk485 million might suggest that the LDT is a highly progressive and effective tax. However, aggregate LDT revenue includes commercial and residential sectors, which, as noted above, are taxed at much higher rates than the agricultural sector. To measure the independent contribution of agricultural land taxes to LDT revenue, a survey of tax records was conducted in the Tangail and (rural) Dhaka districts.

In both tax offices the records of plot ownership and location dated from the early 1960s and were based on cadastral surveys from 1914. The most striking characteristics of the sampled records were the small average plot size and the high fraction of plots subject only to the Tk3 rate per acre (or the minimum Tk1 payment). Figure 4 shows the average tax rate by plot size and the corresponding number of plots. Sixty-eight percent of the sampled plots were smaller than 0.4 acres, and only 2 out of 111 plots were larger than 2 acres. Based on this sample, it seems clear that although some effort was made to assess progressive tax rates above the basic rate of Tk3 per acre, actual tax collections do not reflect the legislated degree of progressivity. Much of this lack of progressivity is due to the minimum Tk1 payment, which results in the smallest plots of land being assessed the highest average tax rates. But the degree of progressivity for the larger plots is still very slight.

The failure of the LDT as a progressive tax may result from the fragmented land holdings of larger farmers. According to the 1977 Agricultural Census, for example, 44 percent of large farmers reported owning 20 or more separate plots. Even among small farmers owning less than 1 hectare (2.47 acres) of land, 43 percent reported ownership of more than 6 plots. But aside from the very smallest plots of land subject to the Tk1 minimum, there was no agricultural plot of land in the sample subject to an average tax rate of more than Tk28 per acre.

There appeared to be substantial difficulty in matching plots of land to individual owners. The tax collector may have knowledge of local land ownership, but, given the large size of districts and land ownership outside of a single district, the collector may find it difficult to identify all the land held by a single owner. To complicate matters further, many plots are registered to long-dead owners (because of slow updating of records) or to multiple siblings or cousins

Figure 4. *Land Tax Rates per Acre by Plot Size in Rural Bangladesh, 1986*



Note: Numbers above the bars denote the number of plots in each size category.
Source: World Bank data and the author's unpublished data.

who have shared in a common inheritance. It appears that, in practice, many of the actual tax assessments were based on "discussion and imagination."

Even after adjusting for possible regional differences in the distribution of plot sizes (Miller and Wozny 1985), agricultural revenue cannot have accounted for more than two-thirds of total LDT revenue. It seems likely that much of the increasing LDT revenue collection in the mid-1980s resulted from collections in urban and commercial districts, and not in agricultural areas. Real tax rates for urban and commercial areas have risen in real terms between 1976 and 1986. Although Dhaka paid 5 percent of total LDT revenue in 1984/85, it accounted for 17 percent of the increase between 1984/85 and 1986/87.

The cost of administration must be subtracted from revenue to determine net revenue to the government. In 1985/86 administrative costs were 66 percent of tax collections, so only 34 percent of LDT revenue was available for central government use. The local tax office does provide valuable services, such as maintaining land records and providing land tax receipts, which are often viewed as informal land titles. Still the average administrative cost per taka of LDT revenue collected exceeds that for other taxes in Bangladesh by a factor of seven. In sum, the LDT on agricultural land is best thought of as a filing fee for annual ownership records, since it provides little revenue for central government operations.

Land Taxation in Argentina

Whereas the land tax in Bangladesh is a dim memory of what it once was, the 'ederal land tax in Argentina remains a dream of what it might be. As Trapido 1988) has discussed in his excellent survey, the intellectual basis for the land tax lates to the early 1960s, when it was viewed as a publicly palatable step toward ınd reform. The first federal government land tax, implemented in 1969 under he regime of General Ongania, imposed a flat tax of 1.6 percent of the market alue of agricultural land. Despite public opposition, land tax collections aver- ged 24 percent of total agricultural taxes (or two-thirds of export tax revenue) luring the few remaining years of the regime (Trapido 1988, p. 52). In succes- ive administrations the land tax was converted to an agricultural income tax, nd tax revenue lagged.

In 1986 a new land tax was proposed to replace the agricultural income tax. The land tax was viewed as preferable to an export tax because it would not lepress output prices and would ensure a more stable supply of revenue to the ;overnment. Although the legislation introducing the land tax referred to the lesirability of decreasing the export tax, this reduction was not explicitly linked o passage of the land tax. Furthermore the land tax revenue was designed not imply to replace revenue, which would be foregone if the export tax were liminated (area *abcd* in figure 2), but to mop up the entire surplus from farmers area *hbce* in figure 2), leaving them without surplus gains. Believing that the ınd tax would be added to an already heavy export tax, farmers opposed the ınd tax, and farming organizations worked to prevent legislative approval of ıe bill.

The vehement protests against the land tax should be understood in light of ıe historical tax bias against agriculture and, in particular, the large share of tax evenue contributed by the agricultural sector (Sturzenegger 1988; Trapido 988). Furthermore the proposed land tax came on top of already quite heavy rovincial land taxes. One study estimated local tax rates on net income from ınd at 10 percent for farmers in the Pergamino region (Trapido 1988, p. 45). A ›cal land tax of this magnitude ensures stiff farmer opposition to a second layer f taxation imposed by the federal government.

An important lesson from the experience with the land tax in Argentina is that nposing a new land tax is a risky investment. The administrative apparatus of ınd taxation, including cadastral surveys and assessor training, must be put in lace before a single austral can be collected. The tax can be thought of as a roject with an up-front cost (for Argentina perhaps $6 million) and with a risky ıture return. For Argentina thus far the investment has not been successful; no evenue has yet been raised under the 1986 land tax proposal.

Land Taxation in Uruguay

Uruguay has enjoyed a more positive experience with land taxation. The land ıx was first proposed in the 1960s by a group of cattle ranchers, who under- ood that, since only one-third of the country's beef output was exported, an

equal-revenue land tax to replace the export tax would shift the terms of trade to favor producers. With the support of the World Bank, the tax was implemented in 1967, accompanied by a reduction in the export tax.

The land tax was originally a presumptive gross income tax based on an index of land quality measured in terms of its potential to produce beef and wool. The tax liability was the product of the land productivity index and an annual adjustment reflecting the output and prices of the baseline land yield. Costs of implementing cadastral and land record surveys were likely eased by the fact that more than half of Uruguay's agricultural land is in farms of more than 1,000 hectares (World Bank data).

A serious crisis occurred in 1974 when beef prices fell dramatically but land taxes based on productivity in 1973 came due. The total direct tax bill for 1973 (including a capital levy and social security taxes) was 43 percent of gross agricultural income in 1974, the year in which the tax was collected. Since net income (even before direct taxes) was negative in 1974, the land tax contributed to an already serious liquidity crisis for cattle ranchers. The ranchers argued successfully that the land tax should be based on net rather than gross income, which resulted in a new tax assessed on net imputed income. Neither the presumptive gross income tax nor the net imputed income tax relied directly on individual farmers' records of costs. During the 1980s the government attempted to move toward a tax based on the accounting records of individual ranchers, but this effort has not been entirely successful in increasing revenues. As an internal Bank study notes:

> The primary problem with the IRA (net income) tax is that it requires a reasonably sophisticated set of records, especially regarding inputs costs, which most Uruguayan farms and ranches cannot currently meet. It seems that such record keeping might be feasible over a period of years, but that the shift to IRA could not be applied on most farms without a significant decline in government revenue. Tax evasion is already a substantial problem in Uruguay.

Nevertheless the land tax contributes a substantial fraction of total taxes collected from the agricultural sector. Between 1977 and 1981 the land tax raised 31 percent of total agricultural tax revenue, and, although that percentage fell during the early 1980s, it had rebounded to 27 percent in 1986 (World Bank data).

The government did not eliminate the export tax entirely. Instead the export tax was often used to moderate the domestic price of beef during periods of high international beef prices. The export tax was used most heavily during the price boom of the early 1970s and later in 1977 and 1984. During downturns in beef prices the export tax was reduced or even removed. In contrast, the land tax collected a relatively stable fraction of agricultural product in the 1970s, although even this tax was removed during years of very poor beef prices (1982–83).

The land tax has provided a relatively steady source of revenue from the

agricultural sector. Although Uruguay has stated its intention to phase out the export tax, it is a likely candidate to stabilize domestic beef prices should world prices rise in the future.

V. What Are the Lessons for Tax Reform?

Although one must be careful in drawing conclusions about the feasibility of land taxation from the historical experiences of a limited number of countries, a few lessons are suggested here.

The Land Tax Is Not Necessarily More Efficient Than Other Types of Taxes

At a theoretical level the land tax suffers from two general drawbacks. First, because the farmer is required to pay a given tax liability in each year, the land tax does not pool risk. The export tax, however, reduces the variance of annual net income so that risk averse farmers may prefer the export tax to the land tax (Hoff 1991). Although the increased risk to farmer income associated with land taxation may not be a fatal shortcoming (Deaton 1990; Skinner 1991), it does throw doubt on the theoretical supremacy of the land tax.

Second, the land tax may be costly to administer. On pure efficiency grounds it doesn't matter whether $1 is lost to society because of traditional inefficiency triangles or because an extra $1 is spent on administrative expenses. The higher cost of enforcing the land tax must be taken into account in comparing the overall efficiency of both tax systems. The question of which tax is preferred on efficiency grounds is ultimately an empirical one that has not been entirely resolved.

The Achilles Heel of Land Taxation Is the Problem of Administration

The theoretical tax base for land taxation is the net income or intrinsic value of the land, but determining land value is problematic. As was shown in Colombia, self-assessment is not particularly effective, since farmers have a strong incentive to underassess their land. There is indeed an incentive to evade any kind of tax. What makes land tax evasion more troublesome is that the true value of land cannot be precisely known. Even if each plot is assessed by trained officials, landowner appeals and the inflationary erosion of the assessment over time can quickly attenuate the revenue potential of a land tax.

Another option is to base the tax on objective measures such as land area and quality. A tax based simply on land area is easy to administer, but the tax is likely to be regressive if wealthier landowners own higher-quality land. Evidence from Latin America, and in particular Uruguay, suggests that land taxation based on crude measures of quality have been more satisfactory at collecting revenue than taxes based on market valuations and represent the most promising avenue for collecting land tax revenue.

Progressive Tax Rates Based on Land Holdings Are Difficult to Administer

Most cadastral surveys are good at identifying land area, soil quality, and the owner of record. But the Bangladesh experience with attempting to link land records to trace ownership across parcels (and across regional districts) suggests that assessing progressive tax rates is difficult. Even if the tax administration could link land ownership records, taxpayers could still avoid the progressive rates by dividing land among family or business associates or by creating a twisted paper trail of ownership records. A small amount of tax evasion can result in large revenue losses under a progressive tax system. In Bangladesh, for example, splitting a 24-acre lot into three equal parts reduces land taxes owed by two-thirds. Evasion and incomplete land records often lead to quite disappointing revenue collection under a progressive tax system.

Land Taxes Have Not Proved Effective in Attaining Nonrevenue Goals

Development experts in the past held great hopes for land taxation to effect desirable nonrevenue goals. It was viewed as a means to encourage more productive use of land and to prompt "voluntary" land reform. However, it has not been successful in achieving these objectives. First, the theoretical underpinnings for why the land tax should promote such objectives is weak. Second, and more important, land taxes rarely have had sufficiently sharp teeth to affect land use decisions. More recently, land taxation has been proposed to encourage environmentally sound land management. Although it seems clear that the World Bank should discourage taxes that encourage environmentally unsound land management, land taxation at its current low rates is unlikely to have more than a marginal effect on improving land use. A better use of land taxation for environmental purposes would be to use the revenue thus collected for local environmental expenditures.

Political Support for the Land Tax Is a Necessary Precondition for Its Success

This may appear to be a tautology, but its fundamental truth is often overlooked. The contrast between the success of the land tax in Uruguay and its failure in Argentina is instructive. The land tax in Uruguay at least partially replaced export taxes in response to political pressure from the ranchers themselves, whereas Argentine farmers viewed the land tax as yet another attempt by urban political powers to extract resources from the agricultural sector. The 1986 Argentine tax reform might have enjoyed more success had farmers believed that the increase in land taxes would be accompanied by a reduction in export taxes.

The Best Potential for Land Taxation Is in Financing Local Governments

Although agricultural land taxation may provide only a trivial fraction of central government revenue, it often accounts for a large portion of local government revenue. For example, in many districts in Indonesia 60 to 70 percent

of discretionary local revenue is provided by the land tax, despite its low rate of only 0.1 percent of assessed value. The lower revenue requirements of local governments allow the land tax to take the form of *in rem* taxes based solely on area or based on crude measures of land quality. As noted above, although these types of taxes cannot raise large amounts of revenue in an equitable way, they have the great advantage of being relatively easy to administer.

Another lesson from country experiences with land taxation is that to succeed, there must be some political sentiment in its favor. It is likely that a local land tax with proceeds used for local betterment or valorization projects would enjoy greater acceptance (or at least lessen smoldering resentment) than a central government tax used to finance projects in far-away cities. The wide acceptance of land taxation for local governments in many different countries (and particularly in Latin America) suggests that the brightest future for agricultural land taxation is not to replace central government export taxes but to provide a resilient source of financing for local government expenditures.

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Taxation of Financial Assets in Developing Countries

Christophe Chamley

In developing countries most of the financial assets are deposits at commercial banks. This article focuses on the implicit taxation of financial assets through seigniorage, reserve requirements, lending targets, and interest ceilings combined with inflation. The impact of taxation on financial deepening increases significantly with the tax rate, as shown by cross-sectional and time series data for selected countries in Sub-Saharan Africa and Southeast Asia. The problem of measuring revenue is examined, and the efficiency cost of taxation is analyzed in a Harberger framework. Although taxes on financial assets have a low administrative cost, the excess burden caused by the misallocation of resources is probably a much higher fraction of revenues than that of other taxes.

The role of financial institutions and credit markets in economic development has been recognized since the well-known studies of Shaw (1973) and McKinnon (1973). Most financial assets in the formal markets of developing countries are deposits at financial institutions. These deposits constitute a large potential tax base that could be taxed at low administrative cost. When the revenue of taxes on financial assets is significant, implicit taxes dwarf explicit taxes. This article considers the effect of implicit taxation through seigniorage, reserve requirements, lending targets, and interest ceilings combined with inflation. The last instrument has often been overlooked, but in some cases, such as Nigeria in the early 1980s, the combination of interest rate ceilings and inflation has generated more than a third of implicit revenue by lowering the cost of government borrowing.

Although the same general economic principles will be at work everywhere, the effects of financial taxation will depend on the stage of a country's development. Financial liberalization will have different effects in the Republic of Korea and Ghana, for example. The empirical material is drawn mainly from countries in Sub-Saharan Africa. Some data on Southeast Asian countries that have experienced financial liberalization is also used. Primary studies on those topics include Chamley and Hussain (1989) and Chamley and Honohan (1990).

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In this article the tax base and the fiscal instruments are introduced first. The impact of implicit taxes on the rate of return and the level of financial assets is analyzed empirically, and the issue of revenue measurement is discussed. The results are then used to estimate the efficiency cost of taxation.

I. The Tax Base and Fiscal Instruments

The menu of financial assets in many developing economies is limited to currency, demand and time deposits, and in some cases deposits at specialized institutions such as merchant banks or savings institutions. Stock markets are embryonic even in the most developed of these countries, as in Nigeria, where trading is thin and price quotes on some of the main stocks remain unchanged for weeks. Government bonds, which could provide the best risk guarantee and liquidity, are not owned by individuals; financial institutions hold most of the government debt outside of the central bank. Therefore in many low- to middle-income countries, and especially in Sub-Saharan Africa, the main base for financial taxation is the extended definition of money, M2.

The fiscal instruments can be divided into two groups: explicit and implicit taxes. Explicit taxes include taxes on loans, interest income, and, in some rare cases, value added taxes. They are defined by stable statutory rates, which are subject to revision, but not more frequently than other items in the tax code. Statutory rates differ from effective rates mainly because of a lack of indexation for inflation. Even so, the average values of the effective rates are in general small, and their variance is dwarfed by that of implicit taxes. In African countries explicit taxes are found mainly where the tax structure is left over from French rule, namely in Morocco, Tunisia, and the countries of the two CFA zones. Such taxes are also found in the Philippines, but they are insignificant in the rest of Asia.

Implicit taxes provide a ready source of government revenue, especially in time of crisis. By definition these taxes do not appear in standard national accounts as tax revenue. Their effective rates are difficult to compute, highly variable, and often unpredictable. Implicit taxes have been very large at times, with annual revenue exceeding 100 percent of the tax base in some cases (for example, Ghana in 1983). Because of the size and variability of implicit taxes and because the impact of financial taxation is evident only when tax rates are high, only the implicit instruments are considered here. The conclusions are applicable, however, to the analysis of explicit taxes on financial assets.

The first implicit tax instrument used is the issuance of currency, or seigniorage. The introduction of new currency debases the money that is already in circulation, and the resulting inflation is a tax on the currency. This tax cannot be separated from the taxes on the institutions of financial intermediation because these institutions provide assets that are close substitutes for the currency. An essential characteristic of this tax is that it operates through a capital loss on the existing currency. Since cash revenue to the government and capital loss to the private sector are not identical, measuring tax revenue becomes a complex

matter, as explained below. It is not always clear whether governments deliberately use seigniorage or inflation to raise revenue. Poterba and Rotemberg (1990) cast doubt on this hypothesis for a set of developed countries. However, the countries they considered have low inflation rates and efficient administrative structures for collecting explicit taxes. In developing countries the small size of the formal sector (with a labor force that may be less than 5 percent of the population), the weak administration of explicit taxes, and the magnitude of potential revenue from implicit taxation make seigniorage an operational instrument.

Reserve requirements, the second implicit instrument, are equivalent to a tax on deposits when reserves earn a rate below that offered by the market. It is sometimes argued that reserve requirements crowd funds out of the markets for private credits. This is correct, but the government could invest the proceeds of the reserves in investment projects earning a return and distribute the earnings to depositors. Required reserves are therefore viewed as an implicit tax with a rate that is equal to the difference between the market rate and the rate paid on the forced borrowings. The only caveat is that by altering requirements on forced borrowings, the government can temporarily generate a cash flow that substantially exceeds the implicit tax due to the difference in the interest rates. Such a policy, however, does not affect the present value of implicit tax revenue.

Lending targets for preferred sectors are an instrument that typically applies to the agricultural sector and are similar to earmarked reserve requirements. In this way they are equivalent to a tax on deposits that subsidizes borrowers with preferential rates.

The last instrument, interest rate ceilings with inflation, has often been overlooked, although it has been one of the most important taxes on financial institutions. It was used in Nigeria before 1986 when all loans were subject to interest ceilings of less than 12 percent (while the inflation rate exceeded 30 percent). Some lending targets for specific sectors with lower rates also had to be met. Given the ceilings on the private loans and the inherent riskiness of these loans, government bonds providing a nominal rate of 9 or 10 percent were very competitive. It is therefore not surprising that their fraction in banks' portfolios was well in excess of the liquidity requirements (in some cases more than 60 percent).

Consider the stylized case of a regime with zero values for interest rates on loans and deposits and a high rate of inflation. In this regime financial institutions (assuming there are no operating costs) will happily buy government bonds that pay a rate of return equal to zero since their risk is less than that of private bonds. Although banks are not forced to hold government bonds, the government is able to borrow "competitively" at no interest all the resources of the financial system, if necessary. This policy is equivalent to a 100 percent reserve requirement and illustrates how the economic effects of different fiscal instruments may be identical, thus complicating the analysis and measurement of revenue.

Ceilings on interest rates may more often be caused by inertia than by policy

design. In the regular course of events ceilings are put in place because of general concern about credit markets (as in Sub-Saharan Africa), usury laws (as in Thailand), and other factors. In normal times the ceilings may be binding, but their effect is relatively small. When a fiscal crisis occurs, however, inflation increases, and, if the ceilings are not altered, their impact becomes significant. The ceilings are then useful for government finances, but unfortunately they also result in subsidization of private loans, thus creating many opportunities for rent seeking. In general, therefore, they impose a greater burden on depositors per unit of government revenue generated than do taxes on deposits or reserve requirements.

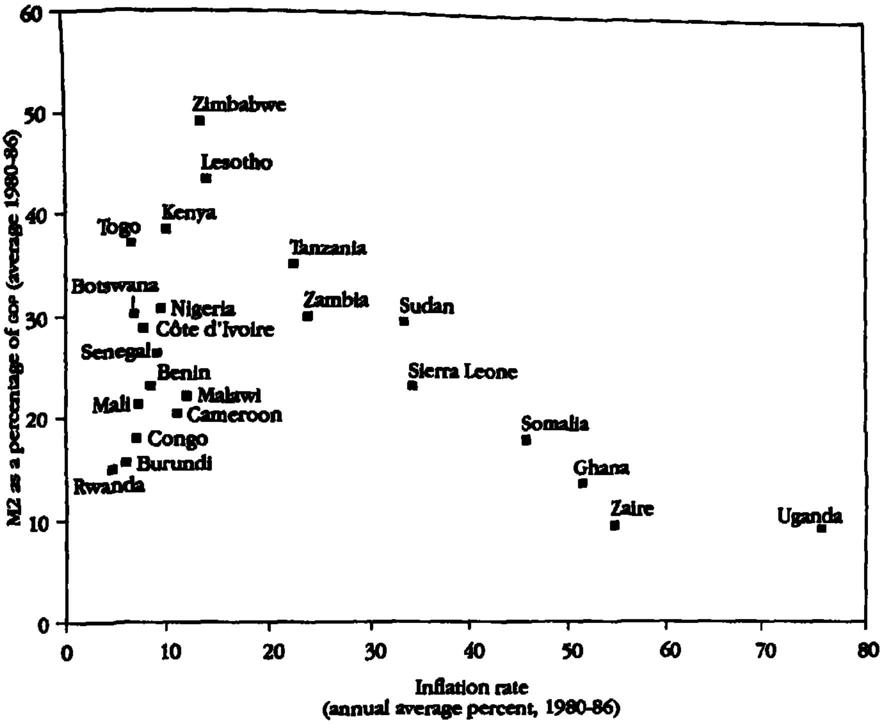
II. Impact of Taxation on Financial Deepening

Financial institutions are by definition extremely highly leveraged: deposits represent more than 90 percent of their liabilities. Some of the incidence of taxes and regulations obviously falls on the equity of the banks and affects its rate of return, but most of the effective taxation on financial institutions falls on deposits.

In some countries interest ceilings, reserve or lending requirements, and inflation have had a large impact on the real rate of return of financial assets. Sub-Saharan countries, in which currency, demand, and time deposits are the main financial assets, constitute a somewhat homogeneous region (with respect to other countries), which makes cross-section comparisons interesting. The cross-sectional data are expected to show how financial deepening, as measured by the ratio of M2 to gross domestic product (GDP), is affected by an inflationary environment. The degree of financial deepening depends on the expected real rate of return on financial assets, which is affected by financial taxation. The data do not allow for a model that would yield reliable estimates of the real rate of return for all countries, so we have used instead either the average inflation rate or the real rate of return on deposits. The two methods yield similar values in figures 1 and 2 because nominal interest rates were fixed for most of the sample. These data are represented in figure 1 for 23 countries in Sub-Saharan Africa. The missing countries are Burkina Faso, Chad, Ethiopia, Liberia, Madagascar, and Niger.

Figure 1 presents a striking pattern: countries can be divided in two groups, non-CFA and CFA. CFA countries belong to one of the two currency zones with a fixed parity with the French franc (a constant nominal exchange rate since 1953) and specific constraints on monetary policy. The non-CFA countries exhibit an inverse relation between inflation and financial deepening, except for Rwanda, Burundi, and Malawi, which have both low inflation and low financial deepening. This apparent anomaly may be explained by differences in urbanization rates. Whereas the urbanization rates for the other countries are 17 to 30 percent (except for Uganda, with 7 percent [World Bank 1988]), those for these three countries are 2, 2, and 5 percent, respectively. The relatively small urban

Figure 1. *Financial Deepening and Inflation in 23 Countries in Sub-Saharan Africa, 1980-86 Averages*

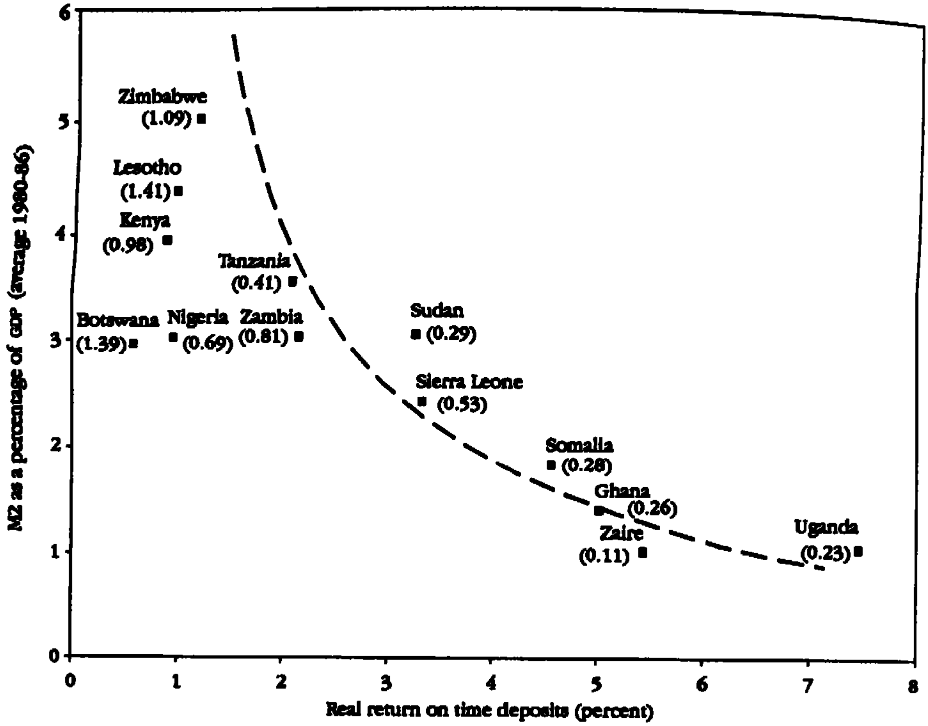


Source: World Bank data.

populations in Rwanda, Burundi, and Malawi would lead one to expect less financial deepening, even with low inflation.

The second group, composed of CFA countries, has experienced low inflation on average because of the institutional restraints on the creation of money, but their degree of financial deepening is generally less than in the non-CFA countries with low inflation. The exception is Togo, with an index of financial deepening 10 percentage points greater than any of the other CFA countries; this difference is probably due to the inflow of funds from neighboring Ghana, where inflation exceeded 100 percent at the same time. The differences in financial deepening between CFA and non-CFA countries cannot be attributed to urbanization rates because these are about the same in both groups. It is possible that, under the special regime of the CFA zone, agents use institutions in France and other European countries for intermediation. Quite remarkably, the low level of deposits in CFA countries is compensated for by large loans from the central bank to commercial banks, so that the level of loans by commercial banks to the

Figure 2. *Financial Deepening and Inflation in 13 Non-CFA Countries in Sub-Saharan Africa, 1980-86 Averages*



Note: The numbers in parentheses are average ratios [(M2-M1)/M1] for 1980-86. The dashed line is the locus of combinations of inflation and M2 yielding tax revenue equal to 6 percent of GDP. The real return on time deposits (X axis) is the difference between the nominal rate and the inflation rate.

Source: World Bank data.

private sector is not much below that in many non-CFA countries. A careful examination of this issue is beyond the scope of this article.

The data are repeated in figure 2 for the subsample of non-CFA countries. The relationship between inflation and the level of financial deepening is weak when the inflation rate is moderate, that is, less than 20 percent on average, as in Botswana, Kenya, Lesotho, and Nigeria. The inverse relation between inflation and assets is strong when the inflation rate ranges from 30 to 60 percent (on average). The ratio of quasi-money (time deposits) to money (demand deposits plus currency outside banks), (M2 − M1 / M1) is also reported for each country in the diagram. At higher rates of inflation the taxation of financial assets has a strong negative impact on the level of quasi-money, which is used as a means of savings. The ratio of time deposits to money is relatively high for countries with low inflation (in Kenya and Zimbabwe ratios are near 100 percent) and low in

the countries with high inflation (in Ghana, Zaire, and Uganda they are less than 30 percent).

Because financial deepening is inversely related to inflation, an increase in inflation from a moderate to a high level may not generate a significant increase in revenue. The measurement of these revenues is a complex issue that will be addressed in the next section, but we suggest as an approximation here the product of the base and the inflation rate, minus a correction for the cost of handling the accounts (which is fixed, arbitrarily, and inconsequentially at 5 percent of deposits). The locus of points at which revenues are equal to 6 percent of GDP is represented by the curve in figure 2. It fits the data for the countries with high inflation rather well, which suggests that these governments did not enjoy increased revenue from increased inflation. This fit is not a strong proof that high inflation does not bring more revenue, but it does indicate that the increase in revenue is not large. On average an increase in the permanent inflation rate from 30 to 60 percent does not generate much higher levels of revenue. It is quite possible, however, that very high inflation rates can generate large revenues for short periods of time.

The weak relationship between inflation and financial deepening when the inflation rate is less than 30 percent also appears to be verified in time series data for particular Sub-Saharan countries. Consider, first, the countries that have experienced higher levels of taxation on financial assets, such as Somalia and Zaire. One would expect to find the most significant impact of taxation on financial intermediation and on financial deepening in these countries.

Estimating the demand for financial assets using ordinary least squares with lagged dependent variables generates an estimate of the long-term interest elasticity that is much overstated. We therefore use an error correction model (Engle and Granger 1987) composed of two equations:

$$\log(M/P)_t = C_1 + \alpha\pi_t + \beta \log y_t + e_t \quad (1)$$

$$D\log(M/P)_t = C_2 + aD\log y_t + b_0 D\pi_t + b_1 D\pi_{t-1} + cD\log(M/P)_{t-1} + \delta e + \epsilon, \quad (2)$$

where M is the financial asset, P is the consumer price index (CPI), y is real GDP, π is the inflation rate, and D is the first difference operator, so that, for example, $D\log(M/P)_t = \log(M/P)_t - \log(M/P)_{t-1}$.

Equation 1 parameterizes the long-run equilibrium relation between the demand for money and the inflation rate. The parameter α is the long-run semi-elasticity of the demand for money and will be used later to compute the efficiency cost of taxation. Equation 2 determines the adjustment of money demand in the short run. The inclusion of the error term from equation 1, e, as an explanatory variable in equation 2 is tantamount to imposing long-run equilibrium on the system, while still allowing short-run deviations from equilibrium. The coefficient on e, δ, is interpreted as the percentage of the gap between the long-run demand for money and the actual demand for money that is closed in

one period. (Thus the name "error correction" model.) The financial asset chosen to be M2, and the estimation period is 1972–86.

Table 1 presents results of the estimation for Somalia and Zaire. Interest r on time deposits were more or less constant for the periods of estimation, so inflation rate is a good proxy for the (ex post) tax rate on financial assets. both of these high-inflation countries there is an inverse relation between level of M2 and inflation ($\alpha < 0$) and a significant inverse relation betw changes in M2 and changes in inflation ($b_0 < 0$). Ghana is another country t experienced very high taxes on financial assets (more than 100 percent a ye but time series estimations of the demand for money turned out to be unstal This may be explained by the dramatic changes in policy (and political) regin during the period studied and by two episodes of demonetizations, which had additional impact on the demand for money that cannot be easily captured standard equations. A more in-depth analysis is presented by Tsikata (1990).

The Sub-Saharan countries that experienced moderate inflation rates on av age include Kenya, Nigeria, Tanzania, and Zambia. There was no signific inverse relation between the demand for financial assets in these countries a inflation or the opportunity cost of deposits. The case of Nigeria is perhaps most surprising because it is one of the most developed countries in Sub-Saha Africa, and the menu of financial assets there extends beyond M2 to incl deposits at merchant banks and an embryonic stock market. The real rate return on deposits was subject to large fluctuations from 1980 to 1985 a

Table 1. *Estimation of Demand for Financial Assets: Somalia and Zaire*

	Estimated value for coefficient	
Equation and variable	*Somalia*	*Zaire*
Long-run equilibrium equation		
Inflation rate	−0.52	−0.53
	(1.85)	(1.68)
Adjustment equation		
Real GDP	0.66	
	(2.09)	
Inflation rate	−0.47	−0.46
	(2.34)	(2.6)
Inflation rate in previous period	0.54	
	(2.28)	
Financial asset[a]	0.88	0.23
	(3.2)	(0.83)
Gap in the demand for money[b]	−0.49	−0.35
	(2.6)	(1.84)
R^2	0.62	0.58

Note: t-statistics in parentheses. When an exogenous variable was not significant, it was omitted fr the specification.

a. Deflated by the consumer price index.

b. The percentage of the gap between the long-run demand for money and the actual demand for money, which is closed in one period.

Source: Author's calculations.

reached values on the order of −50 percent a year. Although these values would have significant effects in many other countries, they did not have a measurable impact on the level of deposits in Nigeria.

The time series and the cross-sectional data lead to similar conclusions. Moderate inflation rates have an impact on the level of deposits that is difficult to detect. This effect is clearly identifiable when inflation rates exceed an average value of 50 percent for an extended period. The low demand elasticities may result from limited substitution possibilities between assets. The main assets for substitution are durable goods and foreign exchange, and trading in these assets may entail fixed costs that limit the extent of substitution when the inflation rate is moderate.

III. Measurement of Implicit Tax Revenue

The revenue from taxation of financial assets is difficult to measure because of the complexity of the instruments. Conceptually, revenue is the product of the assets taxes and the tax rate. Such a simple computation is just not feasible, however, when the main instruments of taxation are only implicitly defined. Four problems arise in measuring the revenue of implicit financial taxation: to define the position of "no taxation," to reconcile the cash flows to the government and the burden on individuals, to determine the impact of expectations on inflation, and to account for the revenues in economies in which financial institutions absorb some of the government debt. The first three appear in economies with or without financial intermediation.

These issues can be illustrated by looking at the simple case of an economy without financial intermediation and with a constant inflation rate. Assume first that the price level is stable and that the economy is growing. Seigniorage, as defined as the revenue from money creation, is positive because currency is issued at the same rate as the real growth rate. Are these revenues taxes? It seems that the answer is "no" since there is no "tax" on money. Friedman (1969) has argued, however, that money should pay a return as capital, if the government could finance this policy through lump-sum taxation. (The proposition can be extended in an economy with distortionary taxation [Chamley 1985].) If we follow this definition of the "no tax" position, the tax wedge on money should be defined as the sum of the inflation rate and the real rate of return on capital. When the growth rate of the economy is lower than the real rate of return, which is required in the long run for efficiency, this tax wedge is smaller than the rate of money creation. This definition implies, therefore, that the implicit tax on money is greater than the level of seigniorage.

Such issues are not of quantitative importance in this article. The difference between the growth rate and the real rate of return on capital is small, on the order of a few percentage points a year, and is certainly negligible compared with the inflation rates in many developing countries. We will therefore assume here that the tax wedge on the currency is equal to the sum of the inflation rate

and the real growth rate. In steady state, tax revenue is equal to the seigniora revenue, that is, the revenue that is generated by creating money.

Unfortunately, the assumption of a steady state is almost always irrelevan and, when it is relaxed, serious difficulties arise. The main problem here is tha the revenue is generated by the flow of the creation of money, whereas the ta burden is induced by a capital loss on the existing assets. In a stationary worl these quantities would be identical; revenue flows and capital losses are als roughly identical on average when the economy fluctuates around a steady stat However, this identity does not provide information on the amount of reven that can be generated in a given year. Furthermore expectations about futu policies affect the current value of the inflation rate. As Sargent and Walla *(1981) have shown, reducing the rate of growth of money can accelerate th inflation rate.*

Two methods can be used to measure seigniorage and can be extended to the taxation of financial assets. In the first method, which we call the rate-of-return method, the tax on financial assets is computed by multiplying the implicit tax wedge on the assets by the stocks. Consider first the case of taxes on currency (seigniorage). The wedge between the imputed and the actual rate of return defines the effective (ex post) tax rate, and revenues are defined by the product of this rate and the amount of currency in circulation. Because of anticipation effects, however, this measure does not give an accurate evaluation of effective government revenues in a given year. Moreover some of the variations in the asset prices may be exogenous to government policies. In addition the data are often available only on an annual basis. Fluctuations of the inflation rate during the year thus introduce additional errors in revenue calculations. For these reasons this method is not used to compute seigniorage revenue (Fischer 1982). The same problems arise when the method is used to measure the revenue from taxes on other financial assets, such as deposits at commercial banks.

The second method used to measure seigniorage revenue is called the cash-flow method and computes the cash flow generated by expanding the monetary base. The cash flow thus generated can be written as

$$R = dM/P. \tag{3}$$

If the data on dM and P were available at every instant, it would be easy to compute the revenue. But the values of dM and P are reported only at discrete times. Moreover the price index available (often the CPI) may be inappropriate if it does not reflect the composition of government expenditures.

For this reason most people use a measure such as the one in Fischer (1982), where the amount of revenue is estimated by

$$R' = \Delta M/Y \tag{4}$$

where ΔM is the incremental change in the monetary base over a discrete period, and Y is the value of nominal GDP over the same period. The value of R', which

is computed with nominal variables, measures the ratio of real income from money creation to the real value of GDP for the period. For most developing countries the minimum period for computing GDP is one year. This formula can be applied using standard national income data with no price index or deflator and is thus convenient. It gives an exact measure of real income when the velocity of money is constant and the rate of growth of money is constant during the period. When one of these two conditions is not satisfied, however, the formula leads to errors. When the inflation rate increases, the first method leads to gross overestimates. This is illustrated below in historical examples.

This method can also be used to measure the revenue from other implicit financial taxes. We have seen that reserve requirements are equivalent to a tax on demand and time deposits. To measure this revenue, these assets can simply be included in the base for the seigniorage revenue in equations 3 and 4. The combination of low ceilings on nominal interest rates, high inflation, and government borrowings has the same effect on government revenue (with an additional rationing on private credit markets). Should the expansion of the government debt then be included in ΔM? This correction is not sufficient even when credits to the private sector finance the arrears of the government (as occurred in Nigeria). The expansion of M2 would be a better measure of nominal revenue when interest ceilings are near zero and inflation is high, but it is inappropriate when inflation is low, real interest rates are slightly below zero, and financial assets are growing because of a surge of the savings rate or financial deepening. The computation of revenue from interest ceilings and inflation is even more complicated when government debt pays a positive, but below market, rate of return.

These issues are ignored in most studies that compute seigniorage revenue. The evaluation of computation procedures depends on the policy background of the countries. For some countries that have only reserve requirements and that allow interest rates to be determined by the market, the standard measure is appropriate (subject to the errors mentioned above). In the countries of Sub-Saharan Africa and in others whose interest rates have been regulated in an inflationary environment, measurement problems cannot be ignored.

In table 2 the two previously described methods are applied to Ghana, Somalia, Zaire, and Zambia. In Ghana the first period of high financial taxation occurred in 1976 and 1977, with inflation rates of 56 and 116 percent, respectively. The revenue from the tax according to the rate-of-return method is equal to 10.7 and 16.9 percent of GDP for the same years. Using the cash-flow method and including the entire expansion of M2 in the cash flow (which is an upper bound on the revenue generated), revenues are 7.3 and 9.7 percent of GDP for these years. Furthermore these numbers may already be overestimates because the velocity of money increased during that period. The results of the two procedures can also be compared for the entire period, 1971 to 1987: the rate-of-return method yields an average amount of 6.8 percent of GDP compared with

the cash-flow method average of 4.8 percent. An accurate accounting would add to both results the revenue from the outright demonetizations that occurred in this period, but this omission affects both measurements equally.

The case of Somalia is somewhat similar. Inflation began to increase in 1979

Table 2. *Two Measurements of Tax Revenues from Implicit Financial Taxation in Ghana, Somalia, Zaire, and Zambia, 1971–86*
(percent)

Country and year	Inflation rate (based on CPI)	Implicit tax rate	M2/GDP	Revenues as a percentage of GDP: Rate-of-return method	Revenues as a percentage of GDP: Cash-flow method
Ghana					
1971	9.5	6.4	18.0	1.1	1.4
1972	10.0	6.7	20.2	1.3	6.2
1973	17.6	13.6	20.8	2.8	3.0
1974	18.1	14.0	19.2	2.7	4.0
1975	29.8	23.6	22.6	5.3	6.6
1976	56.0	42.6	25.1	10.7	7.3
1977	116.4	76.4	22.1	16.9	9.7
1978	73.1	53.1	19.4	10.3	9.4
1979	54.4	41.4	19.6	8.1	2.4
1980	50.0	38.3	16.2	6.2	4.2
1981	116.4	75.9	13.7	10.4	5.2
1982	22.2	17.5	15.5	2.7	2.8
1983	122.8	79.0	9.7	7.6	3.0
1984	39.6	31.0	9.7	3.0	3.8
1985	10.3	7.1	11.4	0.6	3.9
1986	24.5	18.7	11.3	2.1	4.0
Average	63.0	43.8	na	6.8	4.8
Somalia					
1971	−0.0	−0.0	18.9	−0.0	−3.0
1972	−2.0	−3.0	16.5	−0.0	4.5
1973	6.5	5.9	22.2	1.3	3.4
1974	18.2	16.3	23.5	3.8	5.8
1975	19.3	17.0	19.6	3.3	4.7
1976	14.1	12.5	22.1	2.7	3.7
1977	10.5	9.4	22.2	2.1	5.4
1978	9.9	8.9	22.8	2.0	6.2
1979	24.2	21.1	24.7	5.2	7.6
1980	58.8	45.9	27.8	12.8	4.8
1981	44.4	36.0	17.6	6.3	4.5
1982	23.6	19.8	16.3	3.2	2.1
1983	35.9	29.0	15.1	4.3	0.6
1984	91.1	63.7	9.9	6.3	2.1
1985	37.7	29.1	11.1	3.2	6.0
1986	35.7	26.8	12.3	3.3	3.1
Average	37.2	29.0	na	4.9	4.3

(24 percent), peaked in 1980 (59 percent), and was still high in 1981 (44 percent). The revenue computed with the rate-of-return method was equal to 5.2, 12.8, and 6.3 percent of GDP, respectively. For the same years the cash-flow method yields 7.6, 4.8, and 4.5 percent. In both Ghana and Somalia the first

Table 2. *(continued)*

Country and year	*Inflation rate (based on CPI)*	*Implicit tax rate*	*M2/GDP*	*Revenues as a percentage of GDP*	
				Rate-of-return method	*Cash-flow method*
Zaire					
1971	5.7	4.9	20.9	1.0	1.4
1972	15.7	13.9	22.0	3.0	4.1
1973	15.6	13.6	21.5	2.9	6.6
1974	27.4	23.2	23.8	5.5	6.4
1975	29.0	24.6	27.3	6.7	2.3
1976	80.6	59.1	22.8	13.5	7.1
1977	69.0	52.3	24.8	13.0	11.1
1978	48.4	39.1	28.0	10.9	11.7
1979	108.6	73.8	17.1	12.6	0.6
1980	42.0	34.5	14.9	5.1	7.0
1981	34.9	29.4	16.8	4.9	6.8
1982	36.2	30.2	20.9	6.3	10.6
1983	77.1	56.8	18.4	10.4	8.8
1984	52.2	41.5	16.2	6.7	5.1
1985	23.8	20.3	14.6	2.9	3.6
1986	44.4	35.9	15.4	5.5	6.8
Average	53.6	41.4	na	7.8	7.2
Zambia					
1971	6.0	4.3	28.5	1.2	−3.0
1972	5.0	3.4	24.4	0.8	1.3
1973	6.4	4.7	23.6	1.1	4.0
1974	8.0	6.2	22.5	1.4	1.2
1975	10.1	8.2	29.5	2.4	2.9
1976	18.7	15.4	29.4	4.5	6.3
1977	19.7	15.6	33.2	5.1	2.9
1978	16.3	12.6	29.7	3.7	−3.0
1979	9.6	6.6	27.6	1.8	6.5
1980	11.7	8.2	28.3	2.3	1.6
1981	13.9	10.5	27.0	2.8	1.3
1982	12.4	9.0	31.8	2.8	8.3
1983	19.6	14.7	33.0	4.8	2.3
1984	20.0	14.6	32.0	4.6	3.8
1985	37.4	25.1	26.9	6.7	3.7
1986	51.6	34.4	23.7	8.1	13.3
Average	21.2	15.1	na	4.3	4.0

Source: Author's calculations.

method overstates the variations in revenue. For 1971–87 in Somalia the tw methods yield averages of 4.9 and 4.3 percent of GDP, respectively. However, th cash-flow method, which includes all of M2, may also overestimate revenue, a in the years before 1980, which was a period of financial deepening with rela tively low taxation in Somalia. For those years revenues calculated using the firs procedure are smaller than those calculated using the second, sometimes by fou percentage points. These results can also be obtained in other cases (for exam ple, Zaire in 1976), which indicates that in years of high inflation the firs method, which is based on implicit tax rates, seriously overestimates the actua amount of revenue that accrues to the government. When the revenue fror financial taxes is large, therefore, the cash-flow method is more reliable.

IV. Efficiency Cost of Taxation

The most important distortions caused by taxation and regulation of financia institutions concern the level of deposits and the allocation of available funds i credit markets. Although regulations do affect the efficiency of the operations o financial institutions, the variations in the banks' margins of operating costs (les than 5 percent of the deposits) are negligible with respect to the impact o taxation on the rate of return of deposits.

A comprehensive discussion of the efficiency cost of financial taxation shoul consider four types of distortion: the reduction of the level of financial assets i the formal sector and the substitution toward other markets (informal or for eign), distortions in the allocation of the available assets because of regulation such as interest ceilings, interactions between taxes and existing imperfections i the credit markets, and the impact on the level of savings and the intertempora allocation of resources.

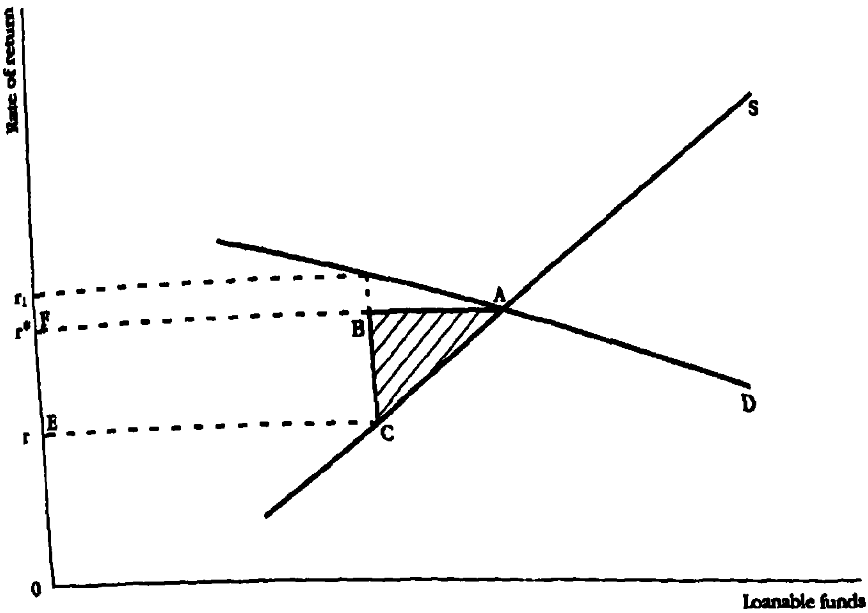
The first three kinds of distortion can be analyzed in a static framework wit an exogenous level of capital that is either constant or increasing at a given rate In many cases the first distortion is sufficient to show that the efficiency cost o financial taxation is high compared with the revenue collected and probabl higher than the cost of standard taxes for many countries. The second and th third types of distortion can also generate high efficiency costs even when th first distortion is relatively small.

The fourth type of distortion is quite different because it operates through th impact on capital accumulation and the effect of capital accumulation o growth. The magnitude of this distortion is more controversial because it de pends on the interest elasticity of savings and the properties of the growt model. Its analysis deserves separate consideration and is beyond the scope o this article.

Measurement

The demand for loans from the financial sector can be simply modeled a depending on the marginal productivity of capital. The supply of funds to th

Figure 3. *The Demand and Supply Schedules for Loanable Funds*



financial sector depends on the rate of return of deposits and on the opportunity cost of using the funds. Alternative uses may include foreign or informal capital markets. The impact of taxation on the level of savings will be neglected here so as to focus on the impact of taxation on the allocation of savings. The inclusion of savings effects would introduce additional efficiency costs (see also Chamley 1985). The rate of return on deposits is equal to the rate of return on the loans of financial institutions, net of operating costs. Assuming as a first approximation that the operating costs per unit of funds are constant, figure 3 shows the demand and supply schedules for loanable funds.

Taxes on financial assets introduce a wedge between the lending and the deposit rates. This wedge creates an efficiency cost that is measured by the area of the Harberger triangle. A nice property of the model is that computation of the efficiency cost requires information on only the elasticities of the demand and the supply of funds. No description of the alternative uses of funds (informal market or consumption) is necessary if there is no distortion in these markets. The existence of distortions may call for some policy intervention. However, the determination of a corrective policy should follow from the analysis of the distortion and its impact on the allocation of funds. This is clearly not the topic that is considered here. Informal markets may present some inefficiencies when compared with intermediation in the formal market. But informal markets

coexist with formal financial markets and present possibilities for economic substitution, because some of their inefficiencies are compensated for by their strengths. As an example, informal credit markets may offer less diversification of risk, but they do provide some special relation between lender and borrower that improves monitoring.

The application of the concept of excess burden in figure 3 also allows for interactions between the schedules of demand and supply: these schedules do not depend only on the rate of return, other things being equal. As the tax reduces the rate of return on deposits in the formal market, the substitution toward the informal sector increases the supply of funds in the informal sector, thereby reducing the equilibrium rate in that sector and thus reducing the demand for loans in the informal sector. Such an interaction decreases the slope of the demand schedule for loans in figure 3. The efficiency cost of the tax is measured by the observed changes of demand and supply that are induced by the tax.

A lower bound of the efficiency cost is approximated in figure 3 by the area of the triangle ABC, which is equal to

$$E = (1/2)(r^* - r)\Delta D \tag{5}$$

where r^* and r are the real rates of return on deposits with no tax and with a tax, respectively, and ΔD is the reduction of deposits that is induced by the tax. This expression is useful for two reasons: there is often little information on the interest elasticity of the demand for loans, and, in some important cases, this expression is likely to capture most of the efficiency cost. The amount of the underestimation is equal to

$$A = (1/2)(r_1 - r^*)\Delta D \tag{6}$$

where r_1 is the marginal productivity of investment when the tax is in place. When the effective tax wedge is large, the value of the real net interest rate r is negative and large in absolute terms, and the interest gap $r^* - r$ is probably much larger than the difference $r_1 - r^*$.

The measurement of the excess burden through the Harberger formula is of the second order with respect to the tax rate and therefore with respect to the amount of tax revenue. Because the average efficiency cost increases linearly with the tax rate, however, the value of the marginal cost increases with the tax wedge and may reach significant levels. Consider a small change of the net rate of return of financial assets, which has an impact dD on the level of the asset held. The marginal efficiency cost MEC is equal to

$$\text{MEC} = -(r^* - r)dD. \tag{7}$$

Revenue (implicit or explicit) is equal to $(r^* - r)D$, and the marginal change in revenues dR is equal to

$$dR = (r^* - r)dD - Ddr. \tag{8}$$

The approximate marginal efficiency cost per unit of additional revenue is simply the ratio of these two expressions:

$$\text{(9)} \qquad \text{MEC} = \{(r^* - r)[D'(r)/D(r)]\}/\{1 - (r^* - r)[D'(r)/D(r)]\}.$$

The sign of D' is positive, so that, as expected, the marginal efficiency cost increases with the interest gap $r^* - r$ and with the response D'. When the demand for financial assets is of the form of equation 1, equation 9 becomes

$$\text{(10)} \qquad \text{MEC} = \alpha/(1 - \alpha).$$

Empirical Estimates

The discussion in section II showed that when the level of taxation is low, it is difficult to observe an impact on the level of financial assets. If any effect exists, it is weak and is dwarfed by other determinants of financial deepening. When the tax rate is high, however, the effect on assets is strong and measurable. Using the empirical results of the previous section and equation 10, the marginal efficiency cost can be computed. These values are presented in table 3 for Somalia and Zaire. These numbers are complemented by others from a previous study on financial liberalization in Southeast Asia (Chamley and Hussain 1989).

The magnitude of the efficiency cost depends on the assumption about the inflation rate (which is reflected in the tax rate assumed in the first column). The values that are presented in table 3 are higher than those obtained by estimating the demand for money in industrial economies with high inflation (Cagan 1956).

From the cross-sectional data it appeared that there was hardly any revenue gain when the inflation rate ranged between 50 and 100 percent, which is the relevant interval for Somalia and Zaire. Indeed there is some reason to believe that the time series results underestimate the true elasticities in developing economies where a process of financial deepening is stopped by high inflation. In the

Table 3. *The Efficiency Cost of Taxation*
(percent)

Country	*Tax rate assumed*	*Marginal efficiency cost*[a]
Somalia	60	0.43
Zaire	60	0.43
	100	1.00
	200	∞
Thailand	5[b]	0.58
Indonesia	13[b]	1.19

a. The marginal efficiency cost of taxation is in terms of marginal revenue.
b. This value is the difference between the average real rate before and after the liberalizations (Chamley and Hussain 1989). The value depends on the estimation of the demand for M2.
Source: Author's calculations.

Sub-Saharan countries with moderate and low inflation financial deepening has progressed gradually since the early 1970s. The development of the financial sector entails fixed costs that can be repaid only in a stable environment. In an environment of high taxes there is no growth of financial assets for savings, and currency in circulation is used mainly for transactions. This motive is less sensitive to the rate of return on money (ratios of currency to GDP are typically not very sensitive to inflation rates of 40 to 60 percent), so that one can expect time series estimates to show relatively low interest elasticities of the demand for money. The problem here is that models of linear equations such as equation 1 may be somewhat deficient for economies that undergo the structural changes associated with economic development. The values given in table 3 should thus be regarded as conservative estimates of the efficiency costs.

Interest Ceilings and Allocation in Credit Markets

Interest ceilings have two effects on credit markets: they discriminate against risky investment projects, and they induce rationing. The first effect occurs as soon as the interest ceiling falls below the market equilibrium rate. The second effect does not occur until the ceiling has dropped to some critical level.

Risky projects are discriminated against because the ceilings apply uniformly to all loans and do not allow for risk premia. The effect is similar to that of the corporate tax in the standard Harberger model, where a fixed amount of capital is allocated between two sectors. When this effect occurs, lenders allocate funds on the margin to the less risky sector (where the rate of return is equal to the ceiling). There is no general rationing, although some of the more risky sectors may be excluded completely. The implication of the Harberger model is that for small tax rates, the efficiency cost is only of the second order with respect to the implicit tax rate.

When the ceiling is sufficiently low or when all projects are identical, rationing may occur. This rationing creates rents and may lead to an inappropriate allocation of the available funds. The maximum efficiency cost of the rationing is thus represented by the area ACEFA in figure 3. In general information is inadequate to evaluate this cost more precisely. However, the cost is of the first order with respect to the implicit tax wedge. For small wedges, therefore, the efficiency cost of rationing is higher than the efficiency cost measured in table 3.

Imperfect Markets

The analysis in this section applied to an economy in which the alternative to holding money is to invest in activities without distortions, that is, in which the private rate of return is equal to the social rate of return. This assumption may not be valid in many cases, but a policy that addresses this issue must rest on a clear evaluation of the distortion. In many instances it will be difficult to arrive at an objective evaluation, but one important case provides additional insight into the empirical estimates of the efficiency cost of financial taxation. We have already noted that, for various reasons, capital markets in developing countries

are subject to imperfections in developing economies. As Shaw (1973) pointed out, a consequence of these imperfections is that investment goods (or any bulky item such as durable goods) cannot be purchased until cash balances have accumulated. This is especially true in an economy without credit, but, even when credit is available, the bank may finance only a fraction of the investment, and the rest will be financed by cash balances (see also Fry 1988).

Consider the problem of an investor who has no access to credit and has a positive cash flow that is saved in money to purchase a durable good. The real value of this flow is assumed to be constant. Assume for simplicity that in an initial environment there is no inflation and that the rate of return on the deposit is nil. Now suppose the inflation rate becomes positive. Inflation acts like a tax on the durable good and increases its effective cost. If the demand for durable goods is relatively inelastic, a positive inflation will push the average level of the cash balance up before the purchase.

This argument has two implications. First, it may explain some of the behavior of deposits in Sub-Saharan countries. In countries with temporary episodes of significant inflation (such as Nigeria or Zambia before 1986), there is no clear relation between the level of money holdings and inflation. Second, it shows that the values in table 3 probably underestimate the efficiency cost of financial taxation. The tax introduces other distortions in the allocation of durable, or even investment, goods that cannot be measured by the Harberger triangle of figure 3. This is particularly clear when the inflation tax causes the demand for durables to fall while the demand for deposit balances remains constant: although the reduction of the demand for durables is a distortion, this is not captured in the computation of MEC in table 3.

V. Conclusion: Financial Taxation and Development

This article has shown that measuring the revenue from financial taxation is not a simple task. The efficiency cost of financial taxation is unambiguously large in terms of the revenue collected when the rate of taxation is more than 30 percent. Tax rates of less than 20 percent seem to have, in proportion to revenue, a much smaller effect on assets and efficiency cost. Similar conclusions have been obtained by Dornbusch and Reynoso (1989). And although it is difficult to detect the impact of small tax rates on the level of deposits at commercial banks, there may be other significant distortions even when the observed interest elasticity of financial assets is equal to zero.

Financial taxation also has an adverse impact on future expectations about taxation and thus affects the development of the financial system. These long-term effects cannot be measured very well by standard time series methods. A comparison of financial taxation in the Sub-Saharan countries indicates that the long-term effects may be significant, but this article is based primarily on data from countries that do not have a sophisticated financial system. As countries develop a larger menu of assets, the possibilities for substitution increase, and

the efficiency cost of financial taxation rises. This can be seen in the effect of financial liberalization in Indonesia and Thailand (Chamley and Hussain 1989), where an increase in the deposit rate of a few percentage points caused deposits to grow more than 20 to 50 percent. The efficiency cost of financial taxation thus depends on the stage of development.

The analysis of the efficiency costs was limited to a partial equilibrium framework. The extension to general equilibrium models with endogenous physical or human capital is an important topic for future research (see, for example, Greenwood and Jovanovic 1989 and Bencivenga and Smith 1991).

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Tax Incidence Analysis of Developing Countries: An Alternative View

Anwar Shah and John Whalley

Misleading conclusions can be drawn from studies of tax incidence that ignore the special features of developing countries. Incorporating these features can sometimes reverse the incidence pattern of taxes relative to what is often taken to be conventional wisdom. Even where patterns are not reversed, quantitative differences can be substantial. The "newer" views of incidence have implications for tax restructuring options being considered in several developing countries. The proposed restructuring may appear to lead only to a more regressive tax system because of improper incidence analysis.

All studies of the redistributive effects of taxes in developing countries calculate annual tax incidence on the basis of assumptions as to how different taxes are shifted onto consumers, producers, factor owners, and other groups (see, for example, Musgrave and others 1951; Gillespie 1980; Pechman and Okner 1974; Musgrave, Case, and Leonard 1974; Browning 1978). The five main kinds of taxes usually considered are income, corporate, sales and excise, property, and social security taxes. Each tax has side effects on sources (capital income, labor income, or transfers) or uses (savings and expenditure patterns by household) or both that reflect how the tax is assumed to be partially or fully borne. In the literature, the terms "shifting assumptions," "incidence assumptions," and "sources and uses side effects" all refer to the treatments adopted to allocate tax burdens and will be used interchangeably here.

I. Tax Incidence Analysis of Developed Countries

The sources and uses side effects of taxes appearing in these incidence calculations reflect their allocation to the components of annual household budget

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constraints, written for simplicity as

$$C + S = K + L + Tr - PT \tag{1}$$

where C and S denote consumption and savings, respectively, and K, L, Tr, an PT are capital and labor income, transfers, and personal taxes. Sources sid effects arise where the composition of income differs by income range. Of th three main income sources assumed to bear the burden of taxes, transfers ar heavily concentrated in the lower tail of the income distribution, capital incom is present in both the upper and lower tails (owing to the presence of retirees and labor income is the closest to being proportional to income. Thus, th progressivity or regressivity of a tax depends on how the sources side effects ar allocated. Uses side effects across households arise primarily where ratios o consumption to savings differ by household. Because a large percentage c household savings is concentrated in the top decile of income distribution, taxe such as sales and excise taxes, which are treated as borne by the consumers o taxed products, are regressive.

To obtain incidence estimates for whole tax systems, separate incidence calcu lations by income range are made for each tax, and these are then summe across taxes, yielding an average total tax rate for each income range. Th extent of redistribution through the tax system is evaluated by examining th pattern of average tax rates by income range. Although it is widely agreed tha net redistribution considering both expenditures and taxes may be of mor interest than tax incidence alone (see Chaudry-Shah 1989, Meerman 1979, an Selowsky 1979) and that lifetime rather than annual incidence calculation should form the basis for evaluating tax reform initiatives (Davies, St. Hilaire and Whalley 1984), data limitations often prevent such evaluations. The majo finding from conventional studies of incidence is that the tax system has littl effect on income distribution.

There are agreements and differences in the key shifting assumptions used i the more significant incidence studies of developed countries (Pechmand an Okner 1974; Gillespie 1980; Browning and Johnson 1979). These studies agre that the individual income tax should be treated as being paid by income recip ients and that it is progressive because of increasing average tax rates. Th studies uniformly treat social security and related contributions as payroll taxe on labor and agree that, outside of the lower tail of the income distribution, suc taxes are regressive because of the ceilings on contributions.

The major areas of disagreement center on the corporate, property, and sale and excise taxes. Corporate and property taxes are sometimes shifted "forward" to consumers, with regressive results, and sometimes shifted "backward" to recipients of capital income, in which case the taxes are progressive. Chaudry-Shah (1989) advocates empirical analysis of capitalized burdens of the local property tax as an alternative approach to the study of property tax incidence. This "capitalization" approach represents a major departure from the traditional

"reasonable assumptions" approaches to the study of the fiscal incidence of the local public sector.

The property taxes attributable to land are assumed to fall on capital income in general, or on landowners, or on capital owners, or half on capital income in general and half on factor income. Of these cases, land taxes on capital owners result in the most progressive incidence pattern; those that fall half on capital income and half on factor income are the least progressive. Three alternative assumptions are common for property taxes attributable to structures and improvements: to capital income in general, or to shelter and consumption, or half to capital income and half to factor income. Of these, the first case yields the most progressive incidence pattern and the second the most regressive.

Because of light taxation of widely held housing capital, corporate taxes are even more progressive if assumed to be borne by capital income specific to taxed industries rather than by capital income in general. In some studies, this motivates the allocation of corporate taxes to dividends rather than to all capital income.

Sales and excise taxes are regressive when they are assumed to be borne by consumers and progressive when they are assumed to be borne by recipients of factor incomes. Ballentine (1981), however, argues that because taxes that are shifted forward fall on capital goods as well as consumption goods, savers bear some of the burden of such taxes, thereby reducing the regressivity of the tax system calculated under assumptions of forward shifting.

II. Existing Tax Incidence Analyses of Developing Countries

Concerns over the equity of tax policies have motivated a number of tax incidence studies of developing countries, more typically of specific taxes rather than of the whole system. These studies generally employed the same shifting assumptions used in the conventional, Pechman-Okner (1974) type of incidence analysis of developed countries and did so in a relatively uncritical way. As a result, the conclusions of these studies with regard to incidence are similar to those found in analyses of developed countries. A small number of recent studies have examined tax incidence using general equilibrium techniques (Habito 1984; Bovenberg 1987; Chowdhury 1990), although the important nontax institutional features of developing countries stressed later in this article do not receive significant attention in this work. On a tax-by-tax basis, the main incidence themes emerging from this literature are as follows.

Sales and Excise Taxes

Most studies find a value added tax (VAT) of a uniform rate to be regressive, but note that this regressivity could be reduced by implementing differential rates for different commodities and a supplementary system of excise taxes on "luxury goods." These incidence analyses usually assume full forward shifting, in

which the tax is allocated among income brackets by using consumption expenditure data. Some recent studies have used an input-output framework to take into account differential rates and exempt commodities (Ahmad and Stern 1988; Bird and Miller 1989a, 1989b) while continuing to assume (implicitly) full forward shifting. Sales taxes at the manufacturer and wholesale levels are also regressive. Full forward shifting is again generally assumed, even though in many developing countries producers and wholesalers typically apply a fixed percentage markup to prices, which prevents full forward shifting. Jeetun's (1978b) study of Pakistan, for example, finds only 35 percent forward shifting from increases in the sales tax at the manufacturer level.

Incidence analyses of excise taxes are typically based on an assumption of full forward shifting although available econometric evidence is once again at variance with this assumption. (Naqvi 1975 and Jeetun 1978b, for example, estimated the extent of forward shifting of excises in Pakistan at 48 percent and 31 percent, respectively.) A progressive incidence pattern is usually obtained for excises in the aggregate. A notable exception is taxes on tobacco and cheap liquor, which usually have a regressive incidence pattern (as in developed countries) because of relatively heavier consumption by the poor (McLure and Thirsk 1978; Cnossen 1977; Bird and Miller 1989b; Asher and Booth 1983). Some excises, such as motor fuel taxes, combine aspects of taxing luxury consumption (based on the ability-to-pay principle) and charges for the use of public services (benefit taxes). To the extent that these taxes serve as user charges, they should not be included in incidence analysis. Import duties are usually assumed to be fully forward shifted to consumers of imported goods, resulting in a regressive or proportional incidence (Jeetun 1978a). Most incidence studies of developing countries ignore the implications of quotas and import licensing for the shifting assumptions used.

When considered as a group, indirect taxes (general sales, excise, and import taxes) are almost universally assumed to be shifted forward to consumers of taxed commodities. With few exceptions (Radhu 1965), backward shifting and incomplete forward shifting have not received much attention. These taxes are found to have a U-shaped incidence pattern, with some regressivity in the lower income ranges for the urban and rural poor (because of general sales taxes and taxes on tobacco and cheap liquor), progressivity in the top income brackets (because of taxes on motor fuels, liquor, and other luxuries), and a flat incidence profile for the middle income groups (Foxley and others 1979; Jeetun 1978b; Malik and Saqib 1989).

Primary products dominate exports from many developing countries. For commodities where no single country or a small group of countries dominates the world market, little forward shifting of the tax to foreign buyers should occur. Most incidence studies, therefore, assume that export taxes are borne by the producer-exporter group, and, because this group is in the higher income range, export taxes are progressive. One recent study for Sri Lanka (Jayasundera 1986) also considered implicit subsidies to domestic consumers associated with

export taxes on tea and rubber and found that these implicit subsidies were distributed in a progressive fashion. The progressive incidence of export taxes may thus be reinforced by the redistributive effects of implicit subsidies.

Income and Property Taxes

Personal income taxes are assumed to fall on the individuals who pay them, and complications stemming from tax evasion are ignored. All incidence studies of developing countries thus show personal income taxes to be progressive. It is commonly assumed that 50 percent of the corporate income tax is shifted forward to consumers, and 50 percent is borne by owners of capital. Under this assumption, the usual incidence finding is a regressive incidence profile for the lowest income brackets, a nearly flat incidence profile for the middle groups, and a progressive incidence profile for the higher income groups.

Urban property taxes are found to be progressive in most studies of developing countries (McLure 1979; Linn 1980; Bahl and Linn, forthcoming; Holland and Follain 1985). For owner-occupied residential, commercial, and industrial properties, the usual shifting assumption is that the tax falls on capital owners with no forward shifting; this is the so-called "new view" of property tax incidence. For rental properties, varying degrees of forward shifting are assumed—a practice consistent with the "old view" of property tax incidence. In general, property taxes on owner-occupied properties are found to have a progressive incidence pattern, whereas taxes on rented properties are regressive. All available studies ignore tax capitalization effects, whereby the imposition of a property tax leads to a fall in the market value of the asset (Chaudry-Shah 1988, 1989). With tax capitalization effects included, a properly administered property tax is likely to be somewhat more progressive than it appears under traditional assumptions.

For taxes on agricultural land, the usual assumption is that such taxes fall on landowners. For subsistence agriculture, such taxes could induce an increase in marketable surplus, as the landowners must earn at least the cash equivalent of taxes in the marketplace. Such behavior would, however, dampen agricultural prices. Some studies (Qureshi 1987) imply that landowners therefore bear more than the burden of the tax because their producers' surplus is reduced as well. Because land ownership is generally concentrated in a few hands in most developing countries, a progressive incidence of such a tax is obtained under these assumptions.

Sectoral and Overall Tax Incidence

Although not emphasized in studies of developed countries, the sectoral incidence of taxes is frequently analyzed in studies of developing countries, either for rural-urban or agricultural-nonagricultural groupings. Such studies usually make assumptions about the fraction of tax passed between sectors. A recent study for Pakistan, for example, assumes that land taxes are borne solely by the agricultural sector while personal taxes and those on manufactured goods are

borne by the nonagricultural sector (Qureshi 1987). Import duties are alloc according to consumption patterns of taxable imports, and other indirect t are allocated by relative weights in consumption. Under these assumptions, agricultural sector emerges as overtaxed relative to the nonagricultural se The same conclusion is also reached by Kazi (1984) for Pakistan, by Lipton Toye 1978) for India, and by Jayasundera (1986) for Sri Lanka. Opposite clusions are reached in several studies on India (Mitra 1963; Gandhi 19 Jayasundera (1986) examines relative tax burdens by income class in the mo (nonagricultural) and primary (agricultural) sectors in Sri Lanka, and concl that individuals with low to lower-middle income are relatively heavily taxe the primary sector compared with the modern sector.

Tax incidence studies of developing countries generally find the overall system to be broadly progressive, showing either a U-shaped (Malik and S 1989 for Pakistan and McLure 1971 for Colombia) or a progressive (Jaya dera 1986 for Sri Lanka, Lovejoy 1963 for Jamaica, and Sahota 1969 for Br incidence pattern. Exceptions to this include Wasylenko (1985) for Jama who finds an inverted U-shaped incidence pattern for the overall tax syst implying that the tax system redistributes from the middle-income groups to poor and the rich.

III. Nontax Policy Elements in Developing Countries and Tax Incidence Analysis

The mechanical application to developing countries of tax incidence anal for developed countries has pitfalls. A wide network of policies surrounds systems in developing countries and must be taken into account in some v Assumptions that are reasonable for developed countries may not be so developing countries. The issue, then, is to determine what kinds of assumpti and analyses are appropriate for developing countries. Because developing co tries are not homogenous, no single approach to tax incidence is applicable t of them. It is still instructive, however, to discuss broad groups of develop countries and the implications of their tax systems for tax incidence analy Table 1 summarizes some of the key features that should be considered in incidence work for different types of developing countries. Nontax institutio features, such as informal or black markets, urban-rural migration, credit tioning, industry concentration, product market competition, price contr import licensing regulations, exchange controls, and quantitative restrictio cartels, and the extent of unionization may alter both shifting assumptions conclusions of conventional incidence analysis of developed countries.

The External Sector

Many developing countries raise a significant portion of revenue from tr taxes. As discussed above, the assumption that import taxes are passed forw to consumers implies that these taxes are proportional or regressive. In m

Table 1. *Key Features for Tax Incidence Analysis for Different Types of Developing Countries*

Feature	Type of developing country in which feature is significant for tax incidence analysis: Low-income agrarian	Lower-middle income	Semi-industrial	Newly industrial
International trade taxes	X	X	X	
Limited coverage of income tax	X	X		
Social security and payroll taxes			X	
Sales taxes		X	X	X
Government ownership in the corporate sector	X	X	X	
Foreign ownership of capital			X	X
Widespread tax evasion		X	X	
Quantity and price interventions	X	X	X	
Widespread black markets	X	X	X	

developing countries, import taxes operate alongside import licensing restrictions, which act as quantity constraints on trade. In addition, foreign exchange may be rationed and may represent a binding restriction on trade (Clarete and Whalley 1986). Advance deposit schemes may also be imposed, under which importers are required to deposit foreign exchange in the central bank for a specified period of time before they are given permission to import. Such schemes are still common in Africa and can also be found in Latin American countries currently experiencing import compression, such as Argentina.

A binding restriction on imports is thus frequently a quantity constraint, with product prices in the domestic market determined by the severity of the quantity constraint. In such cases, tariffs do not affect domestic prices. Instead, tariffs transfer to the government rents that would have accrued to the owners of the rights of access to restricted imports, usually the recipients of import licenses or rationed foreign exchange. In such a regime, trade taxes largely become lump sum and have no flow-through effect on consumers in the form of higher prices (see Clarete and Whalley 1988). If, as would seem plausible, the recipients of importing privileges are predominately the wealthy, then trade taxes in developing countries can reasonably be argued to have progressive incidence effects, not the regressive or proportional effects that are usually reported.

The differences between using conventional shifting assumptions and alternative assumptions suggested by the discussion above are explored in table 2, which shows three kinds of incidence calculations of trade taxes, based on taxation and on household income and expenditure data for Pakistan for 1984–85. First, using traditional assumptions, trade taxes are allocated to consumption expenditures in general, resulting in a regressive incidence pattern similar to those in available studies (Malik and Saqib 1989). Second, when trade taxes are allocated to owners of capital income in general, reflecting the assumption that import licenses are received proportionally to capital income, incidence is prog-

Table 2. *Incidence of Trade Taxes in Pakistan under Alternative Allocation Assumptions*
(tax as a percentage of total income)

	Group subject to the tax burden		
Annual household income (rupees)	*Consumers of traded products*	*Owners of capital income in general*	*High-income holders of import licenses*
Under 7,200	7.8	4.0	n.a.
7,200–8,400	7.1	3.6	n.a.
8,400–9,600	7.0	3.6	n.a.
9,600–12,000	6.9	4.4	n.a.
12,000–18,000	6.8	5.1	n.a.
18,000–24,000	6.5	5.9	n.a.
24,000–30,000	6.3	5.9	n.a.
30,000–36,000	6.2	6.1	12.2
36,000–42,000	6.1	6.1	12.3
42,000–48,000	6.1	6.2	12.6
48,000–54,000	5.8	6.3	12.8
Above 54,000	5.1	7.0	14.0

n.a. Not applicable (see text).
Source: Calculations are for data from 1984–85, based on allocative series derived from Pakistan, Government of (1985) and taxation data from Pakistan, Government of (1988).

ressive. In Pakistan, access to the external sector is actually concentrated in only a few individuals belonging to the top income brackets. Accordingly, a third incidence calculation assumes that rents from licenses accrue only to the top five income brackets in proportion to their share of capital income. The resulting incidence pattern for trade taxes is dramatically progressive.

Price Controls and Black Markets

The widespread use in developing countries of price controls for many items subject to sales and excise taxes renders invalid the traditional (developed-country) incidence assumption of forward shifting onto consumers. If a tax is applied to a price-controlled item, the supplier may or may not be legally allowed to pass the tax forward. Thus, sales and excise taxes are either fully passed forward to consumers or fully shifted backward to recipients of factor incomes, depending upon how the law is written. The incidence outcome does not depend on supply and demand elasticities in markets for taxed products as it would in a typical developed country.

In most developing countries, black or parallel markets arise because of price controls and efforts to evade taxation. An important effect of a sales or excise tax, therefore, may be to change the relative size of black market activity to white market activity which can have important implications for incidence analysis. Mohammed and Whalley (1985) and Nguyen and Whalley (1989) highlight the equilibrium conditions linking black markets and white markets, and show how price changes in white markets, caused, for example, by a tax, reverberate onto black markets. The authors show that if there are penalties for

those caught transacting on black markets and endogenously determined search costs involved in transacting on white markets at the controlled prices (the larger the excess demand, the larger the search costs), buyers and sellers (assuming risk-neutral behavior) on both black and white markets must face the same effective prices in equilibrium (gross of search costs or net of expected penalties) on the two markets.[1]

For simplicity, we assume black market penalties are imposed only on sellers. Thus, for buyers

$$P^B = \bar{P} + S \quad (2)$$

where P^B is the black market price, $\bar{P}$ is the controlled price on official (white) markets, and S is the endogenously determined search cost faced by buyers on official markets.

For sellers

$$P^B - \gamma.K = \bar{P} \quad (3)$$

where γ is the endogenously determined probability per unit sale of being detected selling on black markets, and K is the penalty per unit sold. Mohammed and Whalley (1985) and Nguyen and Whalley (1989) both assume γ is an increasing function of the ratio of black market sales to official market sales. In this framework, changes in price controls affect black market prices, the length of queues on white markets, and the risk of detection for black market traders. Lowering price controls increases the ratio of P^B to $\bar{P}$ and increases queuing or search costs on white markets. Stronger enforcement designed to curtail black markets (higher γ) increases search costs on white markets and can therefore decrease overall social welfare. A sales or excise tax that is passed forward will divert more activity to black markets, increase effective consumer prices (gross of queuing costs), and increase total penalties paid by black market traders. The tax will thus be borne by both the producers and the consumers in ways that are quite different from those deduced from conventional analysis.

The incidence of the tax will also depend upon whether buyers or sellers are liable for the tax. This approach is again different from conventional (developed-country) analysis, in which legal liability for taxes is seen as of no economic consequence. Assuming that black and official markets continue to coexist when a tax is introduced, if sellers on official markets are liable for the tax at rate t, the equilibrium condition for sellers across black and white markets changes:

$$P^B - \gamma K_0 = \bar{P}(1 - t) \quad (4)$$

while equation 2 for buyers is unchanged. The effect of the tax is to divert sales to black markets, which lowers black market prices and increases the proba-

1. A referee has argued that rather than black and white markets facing the same effective price in equilibrium, there may be rents in the latter that accrue to the privileged consumers.

bility of detection. The lower black market prices from equation 2 reduce queuing and search costs on white markets. Consumers (buyers) thus benefit from the tax through lowered prices on the black market and reduced search costs on the white market. This implies that producers (sellers) more than fully bear the burden of the tax, which reflects the reduction in effective seller prices on black markets as well as on white markets.

However, if buyers on white markets are liable for the tax, the equilibrium condition in equation 2 changes to

$$P^B = \bar{P}(1 + t) + S \tag{5}$$

but equation 3 remains unchanged. In this case P^B will rise, which from equation 3 must produce an offsetting change in γ (the probability of detection). Sellers are no better off under the tax, and buyers (consumers) more than fully bear the burden of the tax through increased prices in black, as well as white, markets.

Thus, for sales and excise taxes in this case, with black market penalties borne fully by sellers, appropriate incidence assumptions depend upon the changes in black market activity induced by taxes. Because data are not readily available that allow a link to be made between black market activity and the personal distribution of income, it is not easy to take these effects into account in incidence calculations. Anecdotal evidence, however, indicates that the coverage of price controls and the size of black market activity in many countries is surprisingly large (see Pakistan, Government of, 1987; India, Government of, 1985; Chugh and Uppal 1986; Chopra 1985).

Tax Evasion

Another common feature of developing countries that is neglected in incidence studies is tax evasion. Given the degree of evasion found in many developing countries, the conventional assumption that income taxes are fully borne by the payer of the taxes is inappropriate. (For anecdotal evidence on the extent of tax evasion and bureaucratic corruption in developing countries see Gould and Amaro-Reyes 1983, Carino 1986, and Klitgaard 1988.)

In a simple model in which evasion involves bribery of officials, the bribe, B, is related to taxes owing, T, through the bribe rate, τ. In practice, as Gang and others (1989) suggest, the bribe rate will be endogenously determined, but for simplicity here it is assumed to be fixed, so that $B = \tau T$. An increase in tax rates will raise both T and B. If the bribe rate is high and tax compliance is low, the redistributive impacts of the bribe system will dominate the direct redistributive effects of the income tax. The relevant issue, then, is who receives the bribes.

One scenario is that, through a seniority system in public service, high officials with higher income and wealth receive a large portion (or the majority) of the bribes, along with professionals (accountants) who often act as "middlemen" in this process. Increasing the income tax can thus trigger redistribution from middle-class businessmen and others to wealthy elites, an entirely opposite conclusion to that obtained from applying conventional incidence analysis used for

developed countries to the income tax in developing countries. The extent of tax evasion and its links to rent transfers in particular countries are difficult to determine. To our knowledge, no tax incidence work taking these effects into account has been undertaken.

Rural-Urban Migration

A prominent feature of many developing countries over recent decades has been a rapid increase in rural to urban migration during the developmental phase, which has led to major concern over the effects of policy on migration. While there are several ways of modeling migration (Grosh 1986; Heady 1987; Heady and Mitra 1987), in a Harris-Todaro (1970) model, a rural-urban wage differential through urban unemployment yields an equilibrium condition with equal expected wages across the two sectors. Thus, $W^R = \rho \overline{W}^u$ where W^R is the rural wage rate, ρ is the probability of being employed in the urban sector, and $\overline{W}^u$ is the downward rigid urban wage.

In many developing countries, income and payroll taxes apply de facto only to the modern sector, which can be equated with the urban sector. If the income tax operates as a tax on the urban sector only, increases in income taxes will affect migration patterns and therefore wages in the rural sector. The traditional (developed-country) incidence assumption concerning the income tax, namely, that taxpayers fully bear the burden of the tax out of the income they receive, is inappropriate in this framework (Imam and Whalley 1985). Part of the burden is shifted to rural workers who legally pay none of the tax but whose wages nonetheless fall in response to the tax. Similar issues arise with the incidence analysis of payroll taxes (Whalley and Ziderman 1989).

The potential importance of this effect can be illustrated by using data for Pakistan for 1984–85. In Pakistan only the urban sector is subject to a personal income tax. A graduated surcharge on gross revenue is imposed on the rural sector and acts as a pseudo–income tax, but with very minor consequences for revenue and incidence. In table 3, the traditional approach to the incidence of income taxes implies that these taxes are a progressive element in the overall tax structure in Pakistan.

The Harris-Todaro effect in incidence calculations is captured in two alternative calculations. Whether it is assumed that a significant proportion of the income tax is shifted from the urban to the rural sector in the form of reduced wages for rural households earning less than Rs24,000 a year (most potential migrants come from these income classes) or in the form of reduced rural wages overall, the incidence results change. The discrepancy between the taxation statistics and income tax payments data, as reported in the *Pakistan Household Income and Expenditure Survey 1984–85* (Pakistan, government of, 1985), serves as a proxy for the total income tax burden borne by the rural sector. Under either of these alternative assumptions, a regressive incidence pattern of the tax for the rural sector and an ambiguous pattern of tax incidence for Pakistan as a whole is obtained. Within the urban sector, the income tax remains progressive.

Table 3. *Incidence of Personal Income Taxes in Pakistan under Alternative Approaches*
(tax as a percentage of total income)

Annual household income (rupees)	*No personal income tax in rural sector*			*Form of income tax shift to rural sector* — *Reduced wages for low-income rural households*			*Form of income tax shift to rural sector* — *Reduced rural wages overall*		
	Urban	*Rural*	*Total*	*Urban*	*Rural*	*Total*	*Urban*	*Rural*	*Total*
Under 7,200	0	0	0	0	0.74	0.58	0	0.54	0.42
7,200–8,400	0	0	0	0	0.83	0.63	0	0.60	0.45
8,400–9,600	0	0	0	0	0.88	0.63	0	0.64	0.46
9,600–12,000	0	0	0	0	0.73	0.46	0	0.52	0.34
12,000–18,000	0.02	0	0.01	0.01	0.57	0.35	0.01	0.41	0.25
18,000–24,000	0.04	0	0.02	0.02	0.70	0.38	0.02	0.32	0.18
24,000–30,000	0.02	0	0.02	0.01	0.01	0.01	0.01	0.29	0.13
30,000–36,000	0.20	0	0.13	0.09	0.02	0.06	0.09	0.26	0.16
36,000–42,000	0.22	0	0.16	0.10	0.02	0.07	0.10	0.31	0.17
42,000–48,000	0.40	0	0.29	0.18	0.03	0.13	0.18	0.19	0.18
48,000–54,000	0.77	0	0.50	0.35	0.01	0.23	0.35	0.18	0.29
Above 54,000	1.33	0	1.04	0.61	0.11	0.47	0.61	0.13	0.48

Note: Calculations under "no personal income tax in rural sector" are based on actual tax collections by income class as reported in Pakistan, Government of (1985). All figures from this survey are adjusted to bring the total in line with data from Pakistan, Government of (1988). Income tax collections on household income derived from urban sources or from graduated surcharges on land revenue are effectively zero.

Source: Authors' calculations based on 1984–85 data.

Credit Rationing and Foreign and State Ownership

The presence of credit rationing and foreign and state ownership affect the incidence assumptions appropriate for analysis of the corporate income tax. Credit rationing is a common element in the policy regimes of many developing countries (World Bank 1989). If firms are subject to credit rationing, the corporate tax will operate as if it were a tax on pure rent, much as trade taxes fall on holders of licenses if there are binding quotas. This differs from the trade tax case, however, as the tax will be borne from rents accruing to stockholders of firms as a result of their access to rationed credit.

A significant portion of the manufacturing sector in many countries is either foreign owned or has substantial foreign involvement. If a foreign tax credit applies under the domestic law of the source country (such as in the United States), a portion of the corporate tax may be borne by the treasury of the source country (Shah and Slemrod 1990). In this case both of the traditional polar assumptions of fully shifting the corporate tax back onto capital or forward onto consumers may be inappropriate. Finally, state ownership of the corporate sector implies that the portion of corporate tax revenue that is raised from state-owned enterprises represents an internal transfer of funds within the government, with no direct incidence effects.

Table 4 presents incidence analyses of the corporate tax in Pakistan for 1984–85 under alternative assumptions. The first three columns show incidence calculations using variants of traditional approaches used for developed countries; the corporate tax has a progressive incidence pattern if it is allocated to capital income but a proportional incidence pattern if a significant portion of the tax is

Table 4. *Incidence of Corporate Taxes in Pakistan under Alternative Approaches*
(tax as a percentage of total income)

Annual household income (rupees)	*Income category subject to the tax burden*			*Tax incidence excluding taxes paid by state and foreign enterprises*
	Capital	*Capital and consumption*	*Capital and labor*	
Under 7,200	1.18	1.71	1.56	0.85
7,200–8,400	1.06	1.55	1.64	0.77
8,400–9,600	1.04	1.53	1.70	0.76
9,600–12,000	1.26	1.62	1.69	0.91
12,000–18,000	1.46	1.70	1.69	1.06
18,000–24,000	1.70	1.79	1.68	1.24
24,000–30,000	1.68	1.76	1.69	1.22
30,000–36,000	1.75	1.78	1.68	1.28
36,000–42,000	1.77	1.78	1.66	1.29
42,000–48,000	1.81	1.79	1.65	1.32
48,000–54,000	1.89	1.76	1.63	1.34
Above 54,000	2.01	1.74	1.64	1.46

Source: Authors' calculations based on 1984–85 data.

allocated to either consumption or labor income. To account for the effect of foreign and government ownership, taxes paid by foreign and state enterprises are not allocated. In Pakistan, 22 percent of total corporate tax collections come from state-owned enterprises and another 5 percent come from foreign enterprises having access to some form of foreign tax credit against Pakistan's tax liabilities. The remaining 73 percent of total taxes are allocated to capital income in general, resulting in an overall progressive incidence of the corporate tax, but with lower effective tax rates than in the traditional analyses.

IV. Conclusions

The criticisms herein of existing tax incidence analyses of developing countries are wide ranging. Nontax policies relevant to tax systems in developing countries have not been taken into account in such work. Indeed, the underlying literature on tax incidence in developed countries, on which so much work on developing countries is based, is itself increasingly coming under challenge. Current views of incidence would likely be reversed or quantitative orders of magnitude substantially changed if more appropriate approaches were followed. In short, existing tax incidence studies of developing countries probably contain very little useful information.

At the same time, implementing the new approaches suggested here is not easy. New models of developing countries that accurately capture their special features are needed. The lack of appropriate data is a major (and, in some cases, possibly an insurmountable) problem, and no single uniform approach for all countries makes sense. Although this may seem to be an overly negative assessment, there are nonetheless more positive implications of this discussion that are worth emphasizing.

First, it seems clear that more explicit, rather than implicit, modeling would be helpful in future research (see Clarete and Whalley 1990). Agonizing over forward or backward shifting for this or that tax may be less helpful than writing down an explicit model in which the full implications of assumptions can be traced through. We see this as an eventual move toward numerical, general equilibrium tax modeling, similar to that now being done for developed countries, but with the inclusion of features relevant to the developing country in question.

Second, even without new quantitative analysis, our discussion challenges the traditional approach to tax incidence questions—and, hence, lending decisions—relevant to World Bank operations in developing countries. Even though there are pitfalls with incidence analysis of developing countries and even though it may be impossible to state accurately the incidence of a particular tax, our analysis does shed new light on a whole series of questions about tax incidence in developing countries. These questions need to be understood in the institutionally richer framework that we suggest. It is the challenge to conventional thinking that our analysis implies, rather than the precise answers from

particular incidence calculations, that may prove more important for evaluating tax policy in developing countries in the longer run.

The importance of tax incidence analysis that incorporates features of developing countries can be illustrated by considering what one might term a stylized Bank-Fund package of tax reforms. Such a package would comprise four main components: a reduction of trade taxes and trade liberalization in general; an increased emphasis on production or consumption taxes, particularly the value added tax; a reduction of personal tax rates and a consolidation of the number of brackets; and a reduction in corporate tax rates and the granting of tax incentives to inward foreign investment.

A traditional analysis of the incidence effects of such a package would conclude that the overall impact of the package is regressive, which could lead to substantial problems in implementation. It seems to be equally defensible to suggest that the value added tax is a progressive, rather than a regressive, tax; that significant portions of the corporate tax in various countries are borne by foreign treasuries rather than by domestic capital; and that reductions in personal taxes can have substantially progressive incidence effects because of reductions in evasion and improved administration, ultimately reducing transfers to high-income groups through bribery and corruption. Thus, the incidence effects of the tax reform package could well be quite the opposite of that predicted by conventional wisdom.

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Applying Tax Policy Models in Country Economic Work: Bangladesh, China, and India

Henrik Dahl and Pradeep Mitra

Three examples from the World Bank's country economic work show how models can complement general principles in guiding the design of a tax reform package. The Bangladesh model highlights the sensitivity of judgments about desirable tax bases to assumptions about the labor market and substitutability in production. The China model quantifies the losses from recommending a single rate value added tax when prices are controlled and public capital is freely provided to state enterprises. The India model shows what fiscal adjustment is consistent with tariff reductions undertaken to promote an outward-oriented development strategy. Most of the costs of constructing tax policy models are related to the need to establish a consistent data set and to calibrate the model in a way that allows its behavior to be consistent with what good economic analysis would lead one to expect.

General guidelines are useful in designing the broad contours of a tax reforn package. It is customary to recommend, for example, that the value added ta: (VAT) form the mainstay of the indirect tax system, that corporate taxes cover broad base and treat different sectors and alternative sources of investmen finance neutrally, and that personal income have a small number of brackets an an exemption level that is high enough so as not to strain administrative capac ity. Although a number of developing countries have undertaken fundamenta tax reforms, it is more typical for governments to consider changing particula taxes and their rates as part of budget formulation or planning exercises. I: these situations policymakers are interested in the impact of alternative pro posals on government revenue and the circumstances of different socioeconomi groups. In such cases general guidelines alone are of limited use, and quantita tive analysis is necessary.

This article reports on three tax policy models developed in the World Bank t analyze the impact of tax reform. The first model, used for Bangladesh, demor strates how the relative attractiveness of different revenue-raising options d

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pends on the functioning of labor markets and input substitution elasticities, matters about which conventional partial equilibrium incidence analysis makes strong assumptions. The second model, used for China, emphasizes the importance of taking a systemwide view of taxation in a decentralizing socialist economy, where the coexistence of administered and free market prices for the same commodities can make standard tax reform prescriptions most inappropriate. The third model, drawn from a study of India, examines the domestic tax adjustments needed to allow the government to maintain its real expenditures in the wake of import tariff reductions without any change in foreign borrowing. The costs of constructing and implementing quantitative frameworks of analysis as well as the value of the policy insights provided by them are discussed, and the principal findings are summarized.

I. Bangladesh: The Role of Assumptions about Shifting the Burden of Taxation

This section highlights the influence of assumptions about shifting on the choice of sectors that should be additionally taxed to raise a given amount of revenue. The illustration here focuses on excise taxation, since Bangladesh, in attempting to reduce its dependence on trade taxes, has increasingly relied on the excise tax. This tax, which is levied *ex factory* on domestic goods and some services, now accounts for 97 percent of taxes on domestic production, and in recent years has accounted for 23 percent of all tax revenue. (For a similar analysis of other taxes in Bangladesh, see Dahl and Mitra 1989.)

As with any tax reform, a proposed change in excise taxation affects government revenue and the income of different socioeconomic groups. However, the direction and magnitude of these effects are often determined by assumptions made about shifting the burden of taxation. It is therefore important to examine the sensitivity of those effects and, even more important, the judgments about desirable directions of reform to the range of assumptions about shifting employed in the empirical literature. Thus it has been common in partial equilibrium analysis of tax incidence in developing countries to assume either full-forward shifting, in which commodity taxes are fully passed through to consumer prices, with producer prices constant (Ahmad and Stern 1984, 1987), or full-backward shifting, in which, for example, domestic commodity prices are anchored by world prices so that taxes are passed back, which compresses factor returns in the taxed sectors (Hughes 1986). The assumptions about shifting in the Bangladesh tax policy model presented here are more general and allow consideration of a central case that is intermediate between these polar cases.

In this model household preferences are represented by a linear expenditure system for 10 socioeconomic groups. In each urban and rural area labor supply is isoelastic in the real wage rate for all worker classes but one. The remaining class, informal workers in urban areas and landless workers in rural areas, is

considered residual. Workers in the residual class migrate freely into and out of other classes in the same geographic area, thus providing a pool of labor that adjusts to demands for other types of primary factors. As, for example, in Little and Mirrlees (1974), when demands for other classes of factors increase, the residual class accommodates this demand pressure, thus reducing the supply of rural landless or urban informal workers as appropriate; when demand for other factors decreases, the size of the residual class increases. It is assumed that migrating members of the residual household classes adopt the spending habits of their new class.

The primary factor inputs of each socioeconomic group are aggregated (using a constant elasticity of substitution function) into value added in each of 35 production sectors.[1] Output is a Cobb-Douglas aggregate of intermediate inputs and value added. These assumptions imply in general that a commodity tax increase would be partly shifted forward onto consumers of the commodity through increased prices and partly shifted backward onto factors employed in its production through depressed returns. The degree of shifting is endogenous and depends on, among other things, the relevant supply and demand elasticities for the commodity.

We use the model to determine the sensitivity of desirable reforms to the assumptions about shifting. This is calculated as the percentage increase in *ad valorem* excise taxation of a given sector that would increase total indirect tax revenue by 1 percent (or Tk230 million at 1984/85 prices), holding government expenditures fixed. The experiment is performed for every sector, and the revenue and distributional effects are summarized in a single measure that allows the sectors to be ranked according to the relative desirability of increased taxation on them. After changing the underlying elasticities of the model to reproduce the cases with full-forward and full-backward shifting, the revenue-cum-distributional summary measures and rankings are recalculated. The extent of changes in sectoral rankings from one case to the next indicates the sensitivity of desirable directions of reform to the assumptions about shifting.

As summarized in table 1, the tax rate increases needed to increase indirect tax revenue by 1 percent range from 0.18 percent if rice is the commodity on which taxes are raised, to 16.57 percent, if tea is the chosen commodity. Raising an additional Tk230 million in total revenue requires raising more than that amount from the sector in question. Although this need not always be true, it holds here because the direct and cascading-induced market price increases lead to a reduction in the level of economic activity and imports (and hence import tax receipts) that is not offset by government disposition of the additional tax revenue. Because the individual tax rate increases all raise the same amount of indirect tax revenue and government expenditures are unchanged, the govern-

1. Lack of data on capital in Bangladesh prevents the model from including sector-specific primary factors. Thus the wage rate actually refers to the price of value added.

Table 1. *The Macroeconomic Effects of Raising 1 Percent of Real Revenue from Excise Taxes on Different Commodities in Bangladesh*
(percent)

Taxed commodity	*Increase in excise tax rate*	Increase in: *Consumer prices*	*Trade deficit*	*Excise tax revenue*	*Customs duty and sales tax revenue*	*Distribution effect*[a]
Rice	0.18	−0.17	−0.39	3.31	−0.02	−
Wheat	2.73	−0.08	−0.37	3.31	−0.03	−
Jute	4.10	−0.95	−0.76	3.38	−0.05	−
Cotton	7.02	−0.14	−0.23	3.55	−0.13	?/−
Tea	16.57	−0.05	−0.11	3.27	−0.01	?/−
Other crops	0.61	−0.19	−0.40	3.37	−0.05	?/−
Livestock	1.84	−0.20	−0.41	3.32	−0.03	?/−
Fisheries	0.99	−0.17	−0.38	3.31	−0.03	?/−
Forestry	2.72	−0.06	−0.13	3.38	−0.06	0
Sugar	3.50	−0.09	−0.26	3.53	−0.12	0/−
Edible oil	2.82	−0.11	−0.36	3.41	−0.07	0/−
Tobacco	7.27	−0.10	−0.36	3.32	−0.03	0/−
Other food	3.14	−0.15	−0.37	3.35	−0.04	0/−
Cotton yarn	3.90	−0.24	−0.42	3.64	−0.17	0/−
Cloth	1.11	−0.10	−0.32	3.41	−0.07	0/−
Jute textiles	2.04	−0.01	−0.03	3.26	0.00	+
Paper	8.08	−0.16	−0.27	3.55	−0.13	0/−
Leather	2.91	−0.18	−0.33	3.31	−0.03	0/+
Fertilizer	2.98	−0.13	−0.38	3.33	−0.03	?
Pharmaceuticals and chemicals	2.28	−0.12	−0.32	3.54	−0.13	0/−
Cement	11.13	0.03	0.01	3.47	−0.10	+
Basic metals	1.85	0.01	0.01	3.73	−0.21	+
Metal products	1.20	−0.01	−0.05	3.30	−0.02	0
Wood and other industries	1.32	−0.06	−0.17	3.47	−0.10	0/−
Urban housebuilding	8.78	−0.01	−0.04	3.27	−0.01	0
Rural housebuilding	3.45	0.00	−0.01	3.26	0.00	0
Other construction	1.40	−0.01	−0.02	3.26	0.00	0
Petroleum	0.48	−0.13	−0.35	3.41	−0.07	0/−
Electricity and gas	3.32	−0.13	−0.20	3.39	−0.06	0/−
Transportation services	1.11	−0.19	−0.37	3.40	−0.06	0/−
Housing	2.14	−0.16	−0.36	3.30	−0.02	0/−
Health	6.51	−0.07	−0.26	3.31	−0.03	−
Education	3.29	−0.04	−0.12	3.27	−0.01	0
Public administration	1.35	−0.01	−0.02	3.27	−0.01	0
Trade and other	0.30	−0.20	−0.38	3.44	−0.08	−

a. A minus sign (−) indicates that the excise tax has a regressive impact on real per capita income distribution. A plus sign (+) indicates a progressive impact, a zero (0) indicates a neutral impact, and a question mark (?) indicates that the distributional impact is unclear. ?/− indicates a possibly negative impact, 0/− indicates a slightly negative impact, and 0/+ indicates a slightly positive impact.

Source: Authors' calculations.

ment drain on the economy is in all cases the same so that comparisons can be made across sectors. Thus, if the required increase of the excise tax rate is 1 percentage point in one sector and 10 percentage points in another, it is clear that revenue is more readily raised from the first sector. It need not be preferable to raise taxes in the first sector, however, because the welfare cost or distributional consequences may be undesirable.

The distributional impact of excise tax increases in selected sectors is shown in table 2, which reports the percentage change in per capita real income (income deflated by the consumer price index) by socioeconomic group. The socioeconomic groups are listed in order from poorest to richest based on income in 1984/85. The data on the distributional impact of excise tax increases are used to generate the last column in table 1. Thus a plus (+) indicates progressive impact, zero (0) indicates a neutral impact, and a minus (−) indicates regressive incidence. A question mark (?) signifies that the outcome is unclear.

Tables 1 and 2 show that several excise taxes feature desirable properties: they are effective at raising revenue (column 1 in table 1), have a minimally negative impact on the trade balance (column 3 in table 1), and may even exhibit progressive incidence (table 1, column 6, and table 2). This is true, most notably. of the basic metals sector. It is also interesting that while jute textiles is a satisfactory tax base, an additional tax on jute is strongly regressive. This is mainly because, in contrast with jute textiles, the jute industry is an intensive employer of the rural landless. Since increased taxes are partly shifted back onto factors of production, the landless bear a large burden of the tax.

Although the detail provided in tables 1 and 2 is useful in designing tax reform, a summary measure, which would capture the effects of increased taxation on both revenue and incidence, is necessary here. The loss caused to socioeconomic groups per unit of revenue raised provides a measure of the desirability of intensifying taxation on any particular sector. Of two sectors, the one with the lower (higher) loss per unit of revenue is a better (worse) candidate for taxation in the sense that, at the margin, a revenue-neutral switch in taxation from the worse to the better sector would improve welfare. The model is used to calculate the effect on welfare and on revenue of a marginal (strictly, infinitesimal) increase in the excise tax on each sector, taking into account the general equilibrium interactions of that change; the ratio of the welfare effect to the revenue effect yields the desired summary measure. This is the general equilibrium analog of the measure proposed by Ahmad and Stern (1984, 1987) in evaluating tax reform in the more partial context of full-forward shifting.

Welfare effects across socioeconomic groups are aggregated using the following social welfare function:

$$W = \sum_h N_h U_h^{\nu}/\nu \qquad (1)$$

where N_h is the population of socioeconomic group h, U_h is the per capita utility

Table 2. *The Distributional Impact of Increased Excise Taxes on Different Commodities in Bangladesh, by Socioeconomic Group*
(percentage change in per capita real income)

		Farmers					Rural		Urban	
			Medium-size							
Sector	*Rural landless*	*Small*	*Tenants*	*Owners*	*Large*	*Largest*	*Informal sector*	*Formal sector*	*Informal sector*	*Formal sector*
Rice	−0.43	−0.08	−0.09	−0.10	−0.10	−0.11	−0.05	−0.04	0.22	0.02
Wheat	−0.36	−0.07	−0.08	−0.08	−0.08	−0.08	−0.05	−0.04	0.11	0.00
Jute	−0.88	−0.19	−0.15	−0.15	−0.14	−0.13	−0.01	−0.05	−0.04	0.05
Cotton	−0.25	−0.05	−0.07	−0.07	−0.07	−0.06	−0.05	−0.03	0.19	0.02
Tea	−0.11	−0.02	−0.03	−0.03	−0.03	−0.03	−0.02	−0.01	0.06	0.01
Tobacco	−0.44	−0.09	−0.11	−0.11	−0.11	−0.11	−0.06	−0.04	0.14	0.01
Cotton yarn	−0.42	−0.09	−0.12	−0.11	−0.11	−0.11	−0.09	−0.06	0.21	0.01
Jute textiles	−0.02	−0.01	−0.01	−0.01	−0.01	−0.01	−0.00	−0.00	0.01	0.00
Fertilizer	−0.35	−0.07	−0.10	−0.09	−0.09	−0.08	−0.08	−0.06	0.11	−0.02
Cement	0.00	0.00	0.00	0.00	−0.01	−0.01	0.00	−0.01	0.03	−0.01
Basic metals	−0.01	−0.00	−0.00	−0.00	0.00	0.00	0.00	−0.01	0.01	−0.02
Metal products	−0.05	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	0.01	−0.00
Urban housebuilding	−0.03	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	0.00	0.00
Rural housebuilding	−0.01	−0.00	−0.00	−0.00	−0.00	−0.00	−0.00	−0.00	0.00	0.00
Other construction	−0.02	−0.00	−0.01	−0.00	−0.00	−0.00	−0.00	−0.00	0.01	0.00
Petroleum	−0.36	−0.07	−0.09	−0.08	−0.08	−0.08	−0.06	−0.04	0.17	0.01
Electricity and gas	−0.23	−0.05	−0.05	−0.05	−0.05	−0.04	−0.04	−0.03	0.11	0.02

Note: The distributional impact is the effect on real per capita income from raising government revenue by 1 percent from excise taxes on (different) commodities.
Source: Authors' calculations.

level of socioeconomic group h, and ν is the index of inequality aversion ($\nu \leq 1$).[2]

We choose as the central case a value of -5 for ν, which reflects a degree of inequality aversion greater than that used in many exercises. The reason, as argued in Dahl and Mitra (1989), is the following. Taxation is in practice administered at a level of classification that is significantly more disaggregated than that represented in this model or indeed in most applied general equilibrium models, where the degree of disaggregation is constrained by the availability of data. By taxing different goods that appear within the same sector in the model at different rates, it is possible to target selected households or income groups on the basis of differences in consumption and employment patterns more effectively than can be represented here. Thus, for example, the petroleum sector includes heavy fuels, light fuels, kerosene, and the like, but the distributional characteristics of the groups consuming each of those products are different. The need to tax all commodities making up a "model" sector at the same rate may be viewed as a tax restriction that imposes a constraint on the redistribution desired by even a moderately inequality-averse government (one with, say, $\nu = -1$). To correct for the fact that the conduct of tax policy has, in practice, more flexibility than may be represented in the model, the degree of inequality aversion is taken to be stronger than that expected to be characteristic of a government.

In order to compare the effects of different scenarios of shifting, the labor supply and factor substitution elasticities of the model are designated as the "central case," and those parameters are then varied to generate the polar cases of full-forward and full-backward shifting. In the "central case," in which taxes are shifted partly forward and partly backward, labor supply elasticities are 0.5 for all socioeconomic groups, and the uniform-across-sector elasticity of primary factor substitution in generating value added is 0.5. Although different sets of parameter values can be used to yield full-forward or full-backward shifting, the intent here is to choose parameters in ways that come closest to the important cases of full-forward and full-backward shifting recently produced by Ahmad and Stern (1984, 1987) and Hughes (1986), respectively. To that end, full-forward shifting obtains in the model when all elasticities of substitution between factors are set to zero and the labor supply elasticities by socioeconomic groups are set to infinity.[3] These assumptions effectively allow the primary factors to be aggregated into a single factor, thus ensuring that no unit cost increases resulting from taxation may be shifted back onto factors. Full-

2. The utility function chosen to represent the linear expenditure system is

$$u_h = \prod_i (c_{ih} - \gamma_{ih})^{\beta_{ih}}$$

where c_{ih} is consumption of good i, γ_{ih} is subsistence consumption of good i, and β_{ih} is the marginal budget share of good i. The subscript h refers to a typical member of socioeconomic group h.

3. To achieve numerical stability, labor supply elasticities are set equal to 20.

Table 3. *Sectoral Rankings (by Welfare Cost to Revenue Ratio) for the Three Assumptions about Tax Shifting in Bangladesh*

Sector	*Central case (part forward-, part backward-shifting)*	*Full-forward shifting*	*Full-backward shifting*
Rice	10	2	14
Wheat	29	21	32
Jute	35	31	35
Cotton	21	25	21
Tea	12	17	12
Other crops	15	11	22
Livestock	24	15	30
Fisheries	7	1	10
Forestry	13	19	13
Sugar	22	24	20
Edible oil	28	29	28
Tobacco	33	34	34
Other food	26	26	19
Cotton yarn	34	35	33
Cloth	17	13	25
Jute textiles	6	7	6
Paper	23	27	16
Leather	27	30	26
Fertilizer	14	12	18
Pharmaceuticals and chemicals	25	28	23
Cement	1	6	1
Basic metals	3	8	3
Metal products	9	10	8
Wood and other industries	16	18	15
Urban housebuilding	8	9	7
Rural housebuilding	2	3	2
Other construction	4	4	4
Petroleum	20	16	24
Electricity and gas	19	22	17
Transportation services	32	23	29
Housing	30	32	31
Health	18	20	11
Education	11	14	9
Public administration	5	5	5
Trade and other	31	33	27

Note: Those sectors with the lowest values of the ratio of marginal welfare cost to revenue have the highest rank (1, 2, and so forth).
Source: Authors' calculations.

backward shifting is achieved by setting all labor supply elasticities to zero. This implies that the supply of labor is constant, so that changes in labor demand lead to changes in the real wage rate. Thus, when taxes are increased, factor demands decrease, which lowers the real wage rate.

Table 3 ranks sectors for the three sets of shifting assumptions such that those sectors with the lowest values of the ratio of marginal welfare cost to revenue

enjoy the highest rank (1, 2, and so forth). The ratios of welfare cost to revenue can be affected by the assumption made regarding the disposition of the revenue raised by the government through taxation. The figures reported here are calculated on the assumption that the government saves the additional revenue raised through taxation and uses it in part to retire foreign debt. An alternative assumption (Dahl and Mitra 1989)—that the government invests the extra revenue subject to the current account deficit in the balance of payments being fixed—causes little difference in the rankings.

It is apparent from table 3 that the rankings of sectors can vary depending on which assumptions about shifting are employed. Under all three assumptions, however, cotton yarn, jute, and tobacco are among the worst candidates for taxation. Desirable tax bases are rural housebuilding, other construction, public administration, and, except for the full-forward shifting case, cement. The housebuilding, construction, and cement sectors are linked together and serve investment needs that do not yield immediate welfare effects in the static model.

A dramatic example of the impact of assumptions about shifting on rankings is provided by the rice sector. This sector employs a high share of landless workers, so that when taxes are shifted backward, incomes in this group, which is one of the poorest in the country, are very adversely affected. But this sector's ranking climbs to 2 under full-forward shifting. This is related to the fact that the supernumerary, or above-and-beyond-subsistence, use of rice in the linear expenditure system is not very progressive in relation to income and thus produces much smaller total distributional and income effects than if taxes are shifted backward. Another notable, although less striking, example is the basic metals sector, which becomes a better candidate for taxation the greater the degree of backward shifting. This occurs because the sector employs mainly higher-income classes, in particular, the urban formal sector. However, when taxes are shifted fully forward, the basic metals sector becomes less attractive, since the prices of many other sectors are affected, thus increasing the cost of living for other household groups, including the landless.

The sensitivity of sectoral rankings to assumptions about shifting can be summarized by Spearman rank correlation coefficients. The rank correlation coefficient is 0.79 between the cases of full-forward and full-backward shifting, which is rather low and indicates that judgments about desirable directions of tax reform can be quite sensitive to underlying assumptions about tax shifting. The correlation between the central case and either of the polar cases is, of course, considerably higher; for the central and full-forward shifting cases the correlation is 0.92, while for the central and full-backward shifting cases it is 0.94.

II. China: Tax Reform in the Presence of Price Controls

As in many other countries the VAT is assuming increasing importance in China. The rates, however, are chosen on a product-by-product basis and are

designed to yield broadly the same revenue as the turnover tax, which the VAT replaced. Consequently, a large number of VAT rates coexist in China, ranging from 8 percent on steel to 45 percent on some household machinery and chemicals (World Bank 1990). In this situation tax analysts generally recommend unifying the VAT rate across all sectors that the tax administration is able to reach and setting the rate to generate the same revenue as before unification. To judge whether such advice would be appropriate for an economy such as China's, it is necessary to sketch the important features of the institutional framework within which the tax system is embedded.

First, economic reforms in China have led to the introduction of a dual pricing system that allows state enterprises to purchase part of their inputs and sell part of their output at market prices. Before selling output on the free market, however, state enterprises must first deliver their plan quota at controlled prices (known as state list prices). The inputs necessary to fulfill output targets may be purchased at controlled prices. It is estimated that the proportions of agricultural products, consumer goods, and intermediate goods not transacted at controlled prices in 1986 were 76, 53, and 40 percent, respectively (World Bank 1990). The system of price controls is an implicit subsidy to buyers, which is financed by an implicit tax on producers. Thus, for example, price controls on final goods subsidize final consumers at the expense of enterprises producing consumer goods, while price controls on intermediate goods boost profitability in these enterprises at the expense of those producing intermediate goods. An illustrative calculation suggests that price controls on nonagricultural final goods reduces the index of retail prices by about 7 percent (World Bank 1990). Since indirect taxes must operate within the overall framework of price controls, taxes and price controls must be viewed as an integrated system.

Second, before 1978 state enterprises received all funds for expansion from the state and, in return, remitted all profits to the state. Recognizing that this system greatly reduced any incentive to improve efficiency, reformers introduced "profit responsibility," which replaced profit remittances with enterprise income taxes. The enterprise was allowed to keep its after-tax profits and to divide them among three alternative uses: investment and research and development, a workers' welfare fund, and wage bonuses. Because controlled prices and free inherited capital stocks (the latter equivalent to nonremovable lump sum subsidies) could lead to highly unequal profitability for enterprises in different industries, commodity taxes were set at different rates for different industries.[4] Part of the justification for using taxes to equalize profitability could be removed by setting controlled prices to just cover costs (including any taxes that might be desired for other reasons) and by revising them regularly to reflect changes in those costs. This would not, however, eliminate inequalities in profitability that result from differences in capital stocks provided by the state.

4. Originally the commodity taxes were the product tax and the business tax. These are both turnover taxes and are gradually being replaced by the VAT.

The coexistence of two sets of prices has significant implications for tax policy analysis. Taxes on controlled-price sales are borne by the enterprise and reduce profits, thereby reducing investment, payments into the workers' welfare fund, and bonuses. In contrast, taxes on free market sales can be partly passed on to consumers and affect only the enterprise through reduced demand for its output. Since taxes in the presence of price controls are used to affect profitability in this manner (see World Bank 1990 for estimates), unifying the VAT rate structure without price reform (and charging state enterprises for inherited capital stocks) would be premature.

A tax policy model based on Chinese data was used to explore the losses that would arise from unifying VAT rates in the presence of the dual price system (for a fuller exposition, see Heady and Mitra [forthcoming a]). The model distinguishes 24 production sectors and assumes that unequal profitability generates income inequality through differences in workers' bonuses caused by backward shifting of taxes on controlled-price sales. If, instead, unequal profitability had led either to lower investment or higher external borrowing in lieu of retained profits to finance investment, the eventual result would again have reduced workers' bonuses or welfare funds.

Table 4 demonstrates the welfare losses (measured in GDP equivalents) from imposing uniform taxes and from planning and the existence of free capital. The loss is measured as the percentage reduction in income that would have produced the same reduction in social welfare. The social welfare function used in the calculation is, as before,

$$W = \sum_h N_h U_h^\nu / \nu \tag{2}$$

where N_h is employment in industry h, U_h is the utility function of a worker in industry h, and ν is the index of inequality aversion ($\nu \leq 1$). The utility function is assumed to be Cobb-Douglas in order to calibrate the function from the available data, which report budget shares spent on each sector. We take $\nu = 0$,

Table 4. *Welfare Loss (in GDP Equivalents) from Uniform Taxation and from Planning and Free Capital in China*
(percentage change)

	Extent of planning[a] *(percent)*				
Cause of welfare loss	0	25	50	75	100
Imposing uniform taxes	0.0	1.4	4.7	9.1	14.8
Free capital	8.0	7.6	6.3	5.1	4.2

Note: Welfare loss is measured as the percentage reduction in income that would have produced the same reduction in social welfare. It is assumed that 90 percent of capital stock is provided free by the state.

a. Planned inputs and outputs as a percentage of their 1981 values, assuming that plan prices are the same as in 1981.

Source: Authors' calculations.

hence the above reduces to

$$) \qquad W = \sum_h N_h \log U_h.$$

The first column gives the welfare loss when there is no planning. Although e existence of free capital introduces inequality in profit and bonus payments, e homothetic preferences imposed by assuming a Cobb-Douglas utility funcm prevent commodity taxation from playing a role in reducing such inequal-. With an assumed inelastic labor supply, uniform taxes are (subject to a alification noted in Heady and Mitra [forthcoming a]) optimal in this case. ie second column presents the welfare loss when, for each sector, the planned puts and outputs are equal to one-quarter of their 1981 values and plan prices the same as in 1981. The remaining columns correspond to increasing the in quantities, always as a uniform proportion of the 1981 inputs and outputs. The first row of table 4 shows that the loss from uniform taxation increases pidly with the extent of planning. This occurs because planning introduces equality in profits and bonuses, a consequence that can be offset only by crificing uniform taxation, which preserves efficiency in the goods market. ie losses from uniform taxation are large compared with losses computed in e market economies (see, for example, Ebrahimi and Heady 1988). Even the inning of only a quarter of output produces significant losses if taxes are iform. The second row shows that the loss from planning and free capital, th no uniformity restriction on taxes, is reduced as the amount of planned tput increases because controlled prices allow nonuniform taxes to offset the quality caused by the free capital.

Although the losses from imposing uniformity are substantial, it would be ppropriate to recommend, for example, that any country adopt a VAT with iny different rates, given the administrative cost of doing so and the attendant portunities for tax fraud and rent seeking. Instead, these results should proe evidence that considerable welfare losses could occur if tax rates were ialized without substantial price reform and capital market reform. This ult is reflected in the more institutionally oriented discussion in World Bank 990). Without such reforms, a desirable change, explored in Heady and Mitra rthcoming b), would be to divide goods into perhaps three groups, with a w," "standard," and "high" rate of VAT to capture some of the gains of moving m uniform to sectorally differentiated taxation.

III. India: Replacing Tariffs with Trade-Neutral Taxes

The move toward an outward-oriented development strategy requires lower- tariffs and abolishing quantitative restrictions on trade. However, many veloping countries rely on tariffs to raise significant amounts of public reve-. The *World Development Report 1988* (World Bank 1988) estimates that

the contribution of import taxes to public revenue is more than 20 percent in Asia, Sub-Saharan Africa, and the Middle East and North Africa, compared with 2 percent in the industrial countries. Although converting quantitative restrictions into tariff equivalents would increase revenue, reducing tariffs would be expected to decrease revenue. Several kinds of fiscal adjustments would be required to offset the revenue consequences of tariff reductions in India, a country where import duties represented 63 percent of the value of imports in 1987/88.

As in many other countries, tariffs in India comprise a protective element (known as basic and auxiliary customs duties) and a purely revenue-raising element (known as the additional or countervailing customs duty, CVD) that matches the domestic excise tax. The CVD and the excise tax levied by the central government come under the modified value added tax. In 1987/88 protective customs duties accounted for 31 percent of central government revenue, while CVDs contributed 4 percent and domestic excises 44 percent of central government tax revenue. Reduction of customs duties would therefore have a significant impact on the public finances and would require offsetting policies, most likely increases in excise taxes and CVDs. To make the tax system more trade-neutral, it is important that the adjustment be made to both the excise tax as well as the CVD (Mitra forthcoming). Assessing the budgetary consequences of tariff reduction and estimating the magnitude of the required changes in excise taxes and CVDs requires a framework incorporating the appropriate economywide linkages. In addition the categories used in tariff reform analysis are sectorally disaggregated, so that it is necessary to ascertain how the economywide changes traced above would affect, for example, various subsectors within the manufacturing sector. These objectives are accomplished by implementing two models on a common (1987/88) data base (Mitra and Go forthcoming): a 72-sector disaggregated version, which makes simple assumptions regarding certain economywide relationships, and an aggregated 6-sector version, which makes more appropriate assumptions about those relationships and suggests what corrections ought therefore to be made to the results of the sectorally detailed analysis.

The Indian economy is characterized by a budget deficit of around 10 percent of GDP and a current account deficit of more than 3 percent of GDP. To determine the magnitude of the adjustments required to support tariff reform, we calculate the average increase in excise taxes and CVDs needed to allow the government to finance its expenditures without any change in the trade deficit, given an across-the-board reduction in protective customs duties.[5]

The calculation is accomplished in several stages. First, the required average increase in taxes is calculated in the 72-sector model under the assumption that real returns to factors are held constant at their 1987/88 values. Second, the

5. The increase in excise taxes is confined to the nonagricultural sector, because the contribution of agriculture to excise tax revenue is only 0.03 percent.

responsiveness of the required average increase in taxes to changes in the real factor prices is calculated, again in the 72-sector model. Third, the 6-sector model, with flexible real factor prices, is used to determine the impact of an across-the-board cut in protective tariffs on the real returns to labor and capital. Finally, the change in factor prices (step 3) is multiplied by the responsiveness to factor prices (step 2) to adjust the estimates in step 1.

An across-the-board reduction in protective customs duties has a negative effect on public revenue and, since government consumption is fixed in real terms, on public savings. However, given that around 60 percent of imports are inputs into the production process, a tariff reduction has a favorable effect on output, private sector income, and, hence, private savings. But since only a fraction of extra private sector income finds its way into private savings, the increase in the latter does not completely offset the decline in public savings. With a given trade deficit (foreign savings), total savings in the economy decline and, notwithstanding the fall in the price of investment goods induced by tariff reduction, are not sufficient to finance investment expenditures. Since with fixed expenditures the government saves all additional revenues it receives whereas the private sector saves only part of its additional income, domestic savings may be increased by transferring income to the public sector by increasing excise taxes and CVDs. With real returns to primary factors fixed, it is estimated in the 72-sector model that a 1 percent across-the-board cut in protective tariffs would call for a 0.48 percent increase in excise taxes and CVDs.

Excises and CVDs together accounted for 48 percent of central government revenue in 1987/88 or roughly one-and-a-half times as much as protective duties. Hence it would have been tempting to conclude that an approximately 0.67 percent increase in excise taxes and CVDs would be necessary to offset the impact of a 1 percent reduction in protective tariffs. This, however, takes no account of the fact that the fall in prices induced by the tariff cuts reduces the cost of government expenditure and hence requires a smaller increase in revenue.

By boosting aggregate demand, an increase in real factor prices has an expansionary impact on the private economy and a positive effect on income, consumption, and savings. Although this increases the value of fixed-investment expenditures, the rise in private savings is larger and, using the arguments developed above, requires a reduction in taxes to transfer income away from the government. The adjustment required in excise taxes and CVDs as a result of a 1 percent average increase in nonagricultural real wages and a 1 percent average increase in nonagricultural real returns to capital is calculated to be negative and equals −6.4 and −2 percent, respectively.

The aggregated model maps the 72 sectors into 6 sectors but allows factor prices to be determined endogenously. Labor is mobile across sectors and is supplied with an elasticity of 1.2, except, as in the Bangladesh model, for the residual labor classes in the rural and urban areas. Capital is sector specific, so that its rate of return is residually determined, an assumption polar to that made

in the 72-sector model. A reduction of protective tariffs is expansionary, so that the pull of domestic demand raises real factor prices. Since capital is supplied inelastically in each sector, its average real return is bid up to a greater extent than are the returns to labor. The aggregated model shows that a 1 percent across-the-board cut in protective tariffs has a negligible impact on nonagricultural real wages, while raising average nonagricultural real returns to capital by 0.09 percent.

The previous two sets of calculations may now be used to determine the correction required because of the assumption of constant real factor prices in the 72-sector model. The change in both sets of factor prices yielded by the 6-sector model as a result of a 1 percent across-the-board reduction in protective tariffs (step 3), multiplied by the responsiveness of the adjustment factor for excise taxes and CVDs to changes in those factor prices (step 2), shows that the latter adjustment factor falls by roughly 0.2 percent for a 1 percent reduction in protective tariffs. This should be subtracted from the figure of 0.48 percent arrived at in the 72-sector model with constant factor prices to yield 0.28 percent as the average adjustment factor.

The two models together show that, depending on the assumption that is made about the elasticity of supply of capital to each sector, the order of magnitude of the average upward adjustment to excises and CVDs varies from 0.28 to 0.48 percent in response to a 1 percent across-the-board cut in protective tariffs. To recapitulate, the tariff cut raises real factor returns; the greater the effect on factor prices, the smaller the gap between savings and investment that needs to be made up by increasing trade-neutral taxes.

IV. Benefits and Costs of Tax Policy Models

The models presented above can help to address a broad range of questions in a consistent way. The benefits of these models must of course be measured against the costs that are incurred in their construction.[6] The costs of building and running a general equilibrium model for tax policy analysis may be assessed by considering the phases of a model's "life cycle." Although the phases are not disjointed, the following breakdown is convenient: selection of model structure, compilation of a raw data base, implementation of the model, generation of a consistent data base, calibration of the model, and experimentation with the model.

The formulation of the problem at hand determines the structure of the model in a straightforward way. For instance the evaluation of excise taxes requires a fairly disaggregated description of the production structure, whereas income tax analysis may call for closer attention to income generation, transfer incomes,

6. For a detailed account of how a model can be implemented, see Dahl (1989), which reviews the necessary steps in the context of a particular model.

and the determinants of factor supplies and demands. Studies of trade taxation naturally call for a detailed description of the external sector.

The structure of the model determines data requirements. A typical model uses statistics on production, factor employment and income, demand patterns, foreign trade, and government revenue and expenditure. The data come from diverse sources. National accounts, aggregate foreign trade statistics, and government revenues and expenditures are usually easily obtained, and an increasing number of countries have household expenditure surveys and input-output tables that can be updated using other information. Employment and income statistics are harder to obtain, especially when sectorally disaggregated information is needed. In particular it is normally not possible to find reliable estimates of land use and capital stocks, which then must be "guesstimated," for example, by postulating plausible capital-output ratios. Although it would clearly be desirable to collect time series of such data in order to obtain parameter estimates for use in a model, the most important pieces of information are generally available for (at most) only a few years.

Once a raw data base has been put together, the size and structure of the model to be implemented must be decided upon. This will typically represent a compromise between the desired level of sophistication as chosen in the first step above and the realities of data availability. Until just a few years ago model implementation was a major activity, requiring a great deal of knowledge of computer programming, data base organization, and solution algorithms. The advent of modeling languages has changed this significantly. Today it is a rather straightforward matter to translate formal mathematical relationships into computer statements. For instance the General Algebraic Modeling System (GAMS), in which all three models of this article have been implemented, allows the user to input a model into a computer in virtually the same way it would be written mathematically. A compact algebraic notation allows even models as large as the one used here for Bangladesh, which contains around 2,500 equations and variables, to be written in less than two pages. The modeling languages have, furthermore, made it possible to separate model formulation from the composition of a solution algorithm, so that the formulation may be altered without necessitating corresponding changes in several thousand lines of solver code. Finally, there are several prototypical models available today that may be used as a template to formulate new models. Although each model must focus on the specific issues that it is designed to illuminate, most models share accounting identities and equilibrium conditions, which may be taken from a prototypical model without much editing. These developments make it possible for the modeler to concentrate on the important task of describing behavior and the particular institutional structure of the economy.

The next step in building a general equilibrium model is to manipulate the raw data base to produce a set of data that is specific to the model and consistent with its framework. This is a major task. The raw data base will typically contain data scattered over various years. Sector and commodity groupings tend

to differ among the input-output table, the household expenditure survey, and foreign trade statistics. Different data sources often use different definitions for households and labor groups. These need to be reconciled to produce data for a base year (and preferably for several years) with common definitions of sectors, commodities, labor categories, households, and other entities identified by the model. Once data definitions have been made uniform, inconsistencies in the data must be resolved. For instance, supplies and demands may not match for a given sector, or the savings-investment identity may not hold. Since general equilibrium models must account for all flows in a consistent manner, the data must be adjusted to produce a balanced set of numbers. Although easily implementable algorithms are available for this purpose, they tend to give equal credibility to all data entries and are therefore too mechanical to produce sensible results. It is therefore essential that modelers identify the relatively more and less reliable parts of the data base so as to make reasonable adjustments.

With the model-specific data base in place, calibration can begin. The purpose of calibration is to produce a set of parameters for the model that will enable it to reproduce the base year and to track actual economic performance over several years. Although existing procedures allow for considerable automation, the time-consuming part of the exercise lies in choosing calibration assumptions appropriately, that is, in a way that allows the predictions of the model to be consistent with good economic analysis. Since general equilibrium models embody simultaneous interactions, the structure and properties of the model must be fully understood.

Running experiments with the model, once it has been sensibly calibrated, is not usually very difficult or time consuming, partly because existing modeling languages allow parameters and behavioral assumptions to be readily changed for counterfactual analysis. Equally important from the point of view of the experiments reported in this article, some modeling systems such as GAMS allow optimization of the model. This enables optimal policies to be calculated, as in the China model, and permits comparison of optimal policies with other alternatives, such as the uniform VAT. The optimization feature also makes it possible to find general equilibrium multipliers and elasticities. Even while solving a model with as many unknowns as equations, such as the Bangladesh and India models, and thus involving no optimization, the algorithm calculates shadow prices on all constraints in the model. One set of these constraints could be that excise tax rates are fixed at their current values. If the objective function provided to GAMS is the social welfare function, the shadow price on a tax constraint is interpreted as the welfare cost of changing that tax instrument, allowing for all other changes that would occur to preserve general equilibrium. These features have been extensively used in the experiments with the Bangladesh and India models.

The examples in this article indicate the benefits that may be derived from modeling exercises. First, they allow an extensive range of questions to be investigated. Examples provided here include detailed assessments of tax pro-

posals, the sensitivity of revenue and incidence analysis to assumptions about production structures and labor market specifications, the appropriate design of tax policy in the presence of dual pricing, and the coordinated reform of tariffs and indirect taxes. Second, the range of results available are a useful input into sectoral and project decisionmaking outside the immediate context of tax policy. Thus, for example, raising Tk1 of revenue in Bangladesh through excise taxation imposes an additional economic cost over and above the revenue raised of between Tk1 and Tk2, depending on the particular tax that is raised. This highlights the importance of paying special attention to fiscal consequences in the cost-benefit analysis of public investment projects. This, for example, would reduce the attractiveness of projects that have negative budgetary implications.

Thus although the costs of modeling exercises are high, the average fixed costs of constructing tax policy models are lowered, and the exercise rendered more cost-effective, if the models are used on a continuing basis for policy analysis rather than if they are singular exercises. Thus the Bangladesh model, in addition to being used for tax policy analysis in the World Bank's tax study, has been transferred, at the country's request, to its National Board of Revenue. The China model, in addition to being used for tax analysis, is being extended in an ongoing study on price reform, and the India model has been adapted for an investigation into related macro, fiscal, and exchange rate issues.

V. Conclusions

This article has described three applications of tax policy models developed by the World Bank during the course of its economic work on Bangladesh, China, and India. The Bangladesh model was used to highlight the role of assumptions about shifting tax burdens in influencing the relative attractiveness of different options for raising revenue. Judgments on desirable directions of tax reform based on revenue and incidence analysis were shown to be sensitive to the modeling of the degree of substitution among factors in production and the conditions prevailing in factor markets in the economy. This conclusion applies to comparisons between different model specifications that, far from being extreme, implicitly underpin the assumptions about shifting actually used in partial equilibrium empirical work. Given our uncertainty about the true values of some of the underlying elasticities, and therefore about the validity of different assumptions about shifting, models should be used to identify revenue-raising tax packages that are broadly satisfactory for plausible rather than polar values of the elasticities—an approach that was followed using the Bangladesh model in the World Bank's tax study of that country. Furthermore, the robustness of recommended packages to changes in assumptions about those elasticities should be examined whenever possible.

The China model was used to examine the desirability of recommending broad uniformity of tax rates for a large number of sectors with a dual price system. Given the practical difficulties of administering a highly differentiated

tax system, that exercise provided a measure of the desirability of reforming prices and instituting charges for free inherited capital in state enterprises. More generally, the exercise illuminated the importance of viewing the tax system and its reform in its institutional context.

The India model focused on aspects of the relationship between trade liberalization undertaken to reduce anti-export bias and tax reform, in particular, the need for increases in trade-neutral taxes to offset potential revenue losses arising from reduction of tariffs in an economy in which the tariffs make a substantial contribution to public revenue. Although the need for broadly based tax reform to accompany trade liberalization is seen as important (Mitra forthcoming), the modeling exercise, by keeping track of reform-induced changes in relative prices, can indicate the magnitude of the necessary fiscal adjustment. Moreover this approach also identifies the impact of those macroeconomic adjustments or manufacturing subsectors at a level of disaggregation that is useful for more microeconomic industrial analysis.

Finally, the costs of constructing tax policy models with respect to data requirements, computing demands, and judgments regarding model structure and calibration were reviewed. The two most important and time-consuming elements of model building arise from the need to generate a consistent data base and to calibrate the model. The former requires extensive knowledge of the strengths and weaknesses of the underlying data, while the latter requires a thorough understanding of the structure of the model. These costs must be weighed against the fact that the models are capable, as shown in this article, of addressing an extensive range of questions in a consistent and potentially replicable way. Moreover some of the results generated are useful in sectoral and project analysis that transcend the immediate context of tax policy. The costs of constructing tax policy models are seen as investments in tools that can be used on a continuing basis for many types of policy analysis.

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A Retrospective on the Fifth Anniversary of The World Bank Economic Review

Note from the Editor

This issue completes the fifth volume of *The World Bank Economic Review*. It is a good time to take stock and to thank all those who have contributed to the journal during the past five years: authors, referees, Editorial Board members, and—most important—our readers.

The *Review* is a professional journal for the dissemination of some of the most important output of the World Bank's research program. It publishes original and rigorous research that emphasizes empirical applications and policy relevance. The cumulative index of published articles that follows lists over a hundred items. But several times that number were submitted. All submissions to the journal are sent to three referees—two outside, and one inside, the World Bank—and the Editorial Board relies heavily on their professional judgement. A list of those who have refereed for the journal during the past five years is included to acknowledge, and to thank them for, their contribution.

The *Review* is edited more thoroughly than most academic journals, and authors are pressed to pay special attention to exposition. Thanks are due to our authors and our editors for their patience with this unusual effort to make economics research more accessible.

The journal now has more than 10,000 readers, the great majority of whom are in developing countries. As part of the Bank's commitment to disseminating research, the *Review* is available without charge to readers in developing countries and in the socialist economies in transition.

Many readers have written to us during the past five years. We are happy that you find the journal so useful and stimulating, and we thank you for your comments on the articles and your suggestions about how we can make the *Review* even better. Keep them coming!

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